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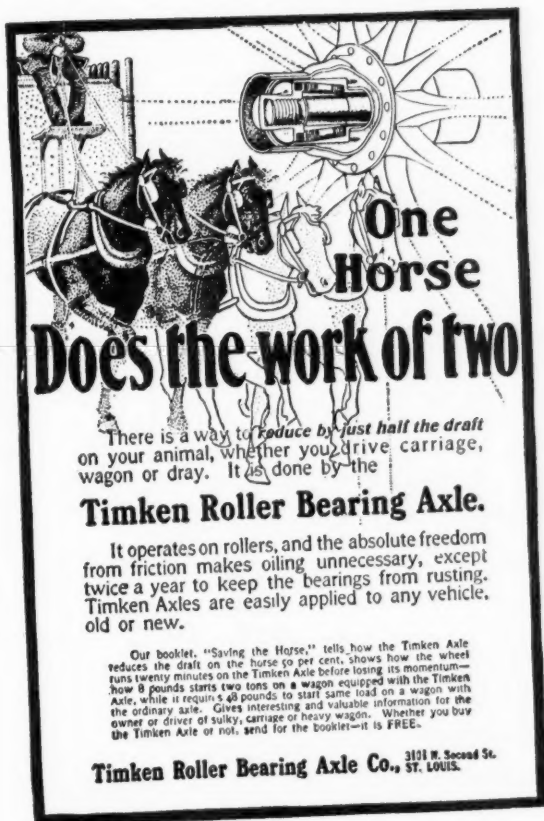
AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

Vol. XLVIII
Number 14

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, APRIL 5, 1923

Thirty-five cents a copy
Three dollars a year



One Horse Does the work of two

There is a way to reduce by just half the draft on your animal, whether you drive carriage, wagon or dray. It is done by the

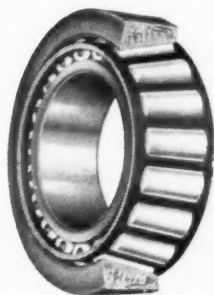
Timken Roller Bearing Axle.

It operates on rollers, and the absolute freedom from friction makes oiling unnecessary, except twice a year to keep the bearings from rusting. Timken Axles are easily applied to any vehicle, old or new.

Our booklet, "Saving the Horse," tells how the Timken Axle reduces the draft on the horse 50 per cent. shows how the wheel runs twenty minutes on the Timken Axle before losing its momentum—how 8 pounds starts two tons on a wagon equipped with the Timken Axle, while it requires 40 pounds to start same load on a wagon with the ordinary axle. Gives interesting and valuable information for the owner or driver of sulky, carriage or heavy wagon. Whether you buy the Timken Axle or not, send for the booklet—it is FREE.

Timken Roller Bearing Axle Co., 3191 W. Second St., ST. LOUIS.

(A reproduction of a Timken advertisement which appeared in the Century Magazine, August, 1901)



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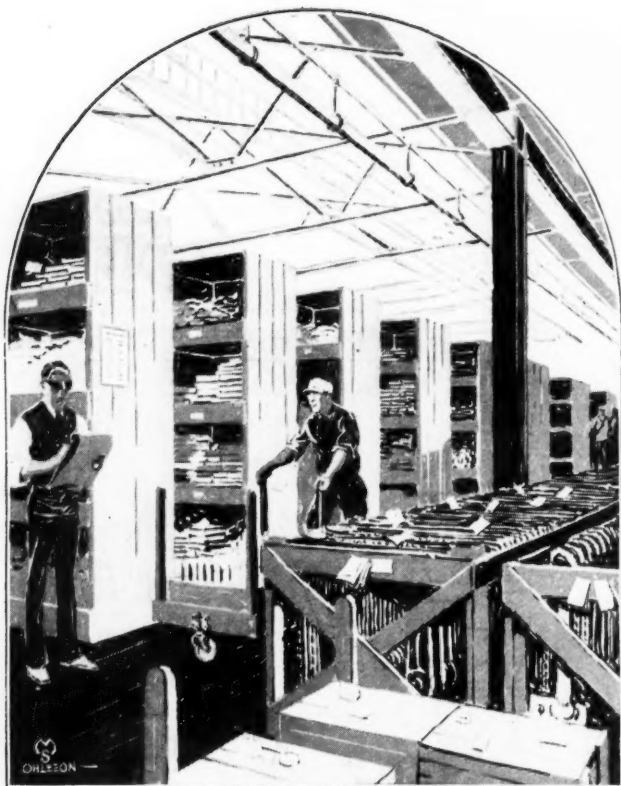
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Since then—80,000,000
Timken Tapered
Roller Bearings
—the best Timken
Bearing adver-
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The Timken Roller Bearing Co
CANTON, OHIO

TIMKEN

Tapered ROLLER BEARINGS

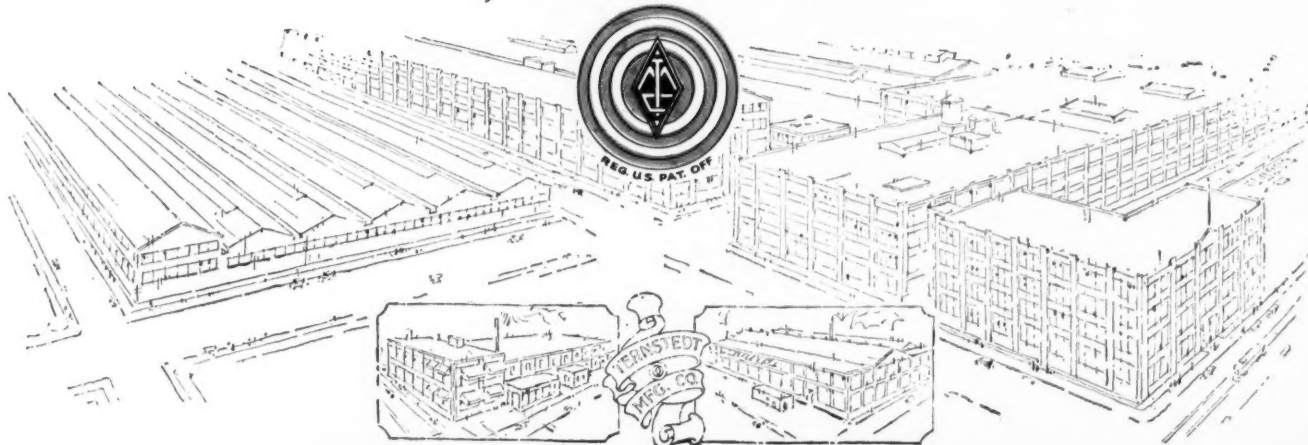


Economy

Purchasing Ternstedt Automobile Body Hardware necessitates no heavy expenditures for large surplus stocks. At the Ternstedt plant is an immense reserve of *equipment for every requirement* of modern body construction, instantly available at your command. Deliveries are made and paid for only as you require them. Capital, ordinarily tied up in additional supplies, is released for other purposes. Space in your plant is conserved. A substantial saving results.

TERNSTEDT MANUFACTURING COMPANY
6307 West Fort Street Detroit, U. S. A.
Division of Fisher Body Corporation

TERNSTEDT
*Largest Manufacturers of Automobile
Body Hardware in the World*



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No. 14

Careful Purchasing Anticipates Changing Trade Conditions

Survey shows manufacturers in Ohio territory alive to economic situation. Determined not to be caught napping. Possibility of sales decline by June generally admitted. Price increases probable. Dealer financing to be given more consideration.

By Norman G. Shidle

AUTOMOTIVE manufacturers in the Ohio territory are planning on what they consider a conservative basis for the next few months. They admit generally that they expect a decline in sales around the middle of the year, but the falling off may be greater than they anticipate.

In any event, there can be no recurrence of conditions such as resulted from the "buyers' strike" which began in 1920. One highly favorable factor is that most manufacturers have profited by that lesson and are studying the economic situation closely. They see clearly many indications that business generally is entering a secondary period of inflation.

It can be said without question that there is little chance of car and truck builders being caught with heavy inventories if production slips in the last six months of the year as it is expected to do. Nearly every factory is buying for immediate needs and commitments are being made for only a short time ahead. This policy is not ideal as a permanent thing, but it does constitute a sound safety measure under present conditions, although short time buying tends to raise prices of materials and parts. It is to the credit of automotive manufacturers, however, that they are not going to be caught as they were in 1920.

There is a general feeling that car production will

recede from the high altitudes in which it has been scaring for the last six months. The curve usually drops in the summer and early fall, although it failed to do so in 1922. Even though the decrease in shipments may be considerably larger than usual this summer, the high production in the early months will make the drop no greater proportionately than in other years.

The parts and material price level for this year may be somewhat high, but the psychology of the present situation is favorable to stability. Little of the 1920 "bally-hoo" spirit is abroad. There is a realization that good business does not mean limitless progress in a few months. The safety valve of careful economic analysis is in much better working order than in any other similar period.

PLANT expansions are going forward rather rapidly in some cases. Too great capacity increase just at present is not wise. Policies in regard to new factory facilities have not been quite so conservative as those relating to inventories. Increased capacity means increased overhead if production shows any temporary decline. One big executive said the other day that he firmly believes the proper thing to do right now is to increase the efficiency and methods of

present factories rather than to add overhead with new buildings. Opinions differ on this score, however, among executives of equal rank and ability.

THE general feeling is that car prices will be forced up by rising material costs. Even in this respect, the automotive situation is better than in certain other industries for car builders recognize that the public is in no mood for inflated prices. Therefore they will make increases unwillingly and as small as possible. They are in thorough accord with the public psychology. In this they have the advantage of those who control some other products. Any general inflation, of course, will react on car and truck sales, but the present attitude of car builders toward prices augurs a favorable public reaction to the moves they will probably make.

The transportation situation is already disturbing automotive manufacturers. Hundreds of driveaways are going out from car factories every day. Indications are that the railway car shortage will get worse rather than better during the next six months.

E. T. Howson of *Railway Age*, speaking last week at the National Conference of Business Paper Editors, stated that manufacturers may expect within the next few months the most acute railroad car shortage ever experienced in this country. He based his statement on the fact that about 91 per cent of the total car capacity has been in use during the last few months which are usually slack. The peak is expected in July and August when movements of grain begin. The railways have ordered considerable new equipment, Howson said, but there is no hope that any considerable help will come from this source. New cars are being added more rapidly than old cars are being scrapped, but this condition has held only very recently.

Manufacturers can do one thing to alleviate the difficulties. They can exercise more care in packing so that each car will go out carrying its full capacity. This will be economical in itself as well as beneficial to the general condition. For the rest it will be well to fit shipping to car availability and to anticipate needs as far in advance as possible.

Should Howson's prediction come true, the shortage will affect automotive manufacturers less than at any other time of the year in the movement of their products. Thus the industry can look on the sunny side of trouble even as regards this very serious railroad transport situation.

While it is pretty generally agreed that a decrease in automotive production may be expected within the next three months some difference of opinion exists as to the probable extent of the decline. Estimates of 1923 passenger car production range all the way from 2,000,000 to 2,700,000. No estimates have been below 2,000,000. It appears practically certain that the entire year holds reasonably good and profitable business for the car makers despite any cloud on the horizon.

The truck field presents a somewhat different aspect. Predictions about total production are so hazardous that few dare to make them. More trucks will be sold in 1923 than in 1922. Further than this it is difficult to go.

Merchandising methods and possibilities are confused. The situation is affected by many things not involved in the general business trend. The former seems to be coming back into the market and general truck prospects are bright. Many weak companies are fighting hard for existence, however, and some of the soundly financed organizations are doing little more than marking time and trying to break even. The future for some organizations is uncertain.

In the meantime new truck markets are being opened. Smaller companies in many cases are pioneering the way in selling the truck idea to industries which heretofore have been limited users of motor vehicles. One sound, small company, for example, is definitely refraining from trying to compete with its big rivals in the department store, contracting and other fields where the latter are firmly established. This concern is concentrating its efforts on the milk, furniture, stockyard, cross-country transport and other types of business in which it hopes to establish itself firmly by virtue of getting in on the ground floor. How successful its efforts will be cannot

be judged immediately. The plan is mentioned, however, as an example of one truck merchandising policy.

There is a general feeling that the truck business for the next nine months will be reasonably good without any strongly marked peaks, but that no startling recovery or new developments are likely.

A general labor shortage prevails in the metal trades. Bidding for men is common in certain areas but has not assumed alarming proportions in general. Workmen show a tendency in certain parts of the industry to demand increased wages as a result of better industrial

conditions. Automotive plants have generally anticipated these demands, however, so that little difficulty has resulted. If car prices go up and general commodity prices rise, workers are very likely to expect further increases in line with the general psychology.

Some manufacturers may be seriously embarrassed if such a situation arises. The only logical way out is to begin at once to let employees know as many facts as possible about the company and the general situation, with the idea of convincing them that the management desires to give them a fair share of any benefits that may accrue from rising prices.

To establish such a relationship of confidence in a few months may be impossible where suspicion has been the rule in the past. Manufacturers who have built good will on the basis of confidence and fair dealing over a period of years will benefit, of course, when a situation of this kind arises. Establishing such relationship does not mean starting "propaganda." The two processes are mutually incompatible.

DEALER competition continues keen. The important phase of the dealer situation is finance, especially as related to the probable trend of sales in the next nine months.

New car sales have been enormous, but used car difficulties are constantly growing. Should new car demand taper off, the used car problem promises to become acute. Used cars are a constant menace to the poorly financed

THIS story gives the results of a survey of automotive manufacturing just made in Ohio territory. The conclusions presented are drawn from many sources. They represent the opinions of men engaged in all phases of the automotive industry, such as car builders, parts manufacturers, machine tool men and those supplying raw materials.

Taking a cross-section of the industry has permitted a broad view. Undue weight has not been given to the opinions of car manufacturers alone. It shows that automotive conditions are fundamentally sound and that executives are keenly alive to the economic situation.

dealer when the sales barometer is falling. When demand recedes from its peak, the dealer needs better financial facilities to carry his load than when the sales curve is upward. The financial strength of dealer organizations is likely to be more important than volume of sales in the last months of 1923. Some manufacturers are definitely preparing to play a larger rôle in providing dealer credit facilities. Their efforts will go far toward keeping the automotive ship on an even keel.

The manufacturer has a definite responsibility in connection with used cars, particularly during a period when the sales curve is receding from its peak. He must expect his dealers to be affected by the general situation, just as dealers for other makes of cars are affected. His particular dealers cannot keep sales up to the peak, while others are unable to do so. He may have an excellent organization but it is composed of human beings with ordinary business abilities and resources.

He can rightfully expect his dealers to do their part in running their business on a sound basis, he can expect and urge them to make trades properly on a profit making basis. But the manufacturer's responsibility lies in adapting his production as best he can to sales conditions; in refraining from forcing cars on the dealers. Thus he can provide his dealers with a situation in which they can trade logically and intelligently without forcing themselves out of business by attempting to buy for cash more than they can immediately sell on time.

"A manufacturing company is as strong as its dealer organization," a leading executive said the other day. He told the whole story briefly and clearly.

Survey of the situation shows automotive conditions to be fundamentally sound. It indicates a good business throughout 1923 with a recession from the peak of sales in the latter part of the year. Executives in general have never been more alive to conditions as they exist.

Stewart Adds One-Ton Speed Truck to Line

A NEW one-ton speed truck has been added to the line of the Stewart Motor Corp. The chassis has a wheelbase of 130 in. and weighs 2650 lb. less seat, cab and windshield.

The engine has four cylinders with $3\frac{3}{4}$ by 5-in. bore and stroke, giving an S.A.E. horsepower rating of 22.5. The actual horsepower developed is 43. Lubrication has full pressure feed automatically controlled by a lever connected with the foot accelerator. The crankshaft has five bearings $2\frac{1}{8}$ in. in diameter and all the connecting rods and crankshaft bearings are bronze backed babbitt lined.

Cylinder head and cylinder block are both of the removable type. The crankcase is well ribbed to prevent distortion and vibration and heavy ribs are used to support the five crankshaft bearings. Pistons are of cast iron with $1\frac{1}{8}$ -in. pins. Cooling is by thermo-syphon system.

Engine accessories include a Zenith carbureter, Remy electrical system, including a starter, and cellular type radiator with a removable core.

The clutch is of the multiple disk dry plate type, with automatic adjustment, having four disks with double facings and three plain disks 8 in. in diameter. A three-speed gearset is used. The main shaft is mounted on annular ball bearings and the rear bearing on the main shaft is of the double row annular type. The gearset is supported from the bell housing of the engine and the entire powerplant is supported by the frame at three points.

Semi-elliptic springs are employed both front and rear. The dimensions of the front set are $38\frac{1}{2}$ by $2\frac{1}{4}$ and the rear set 50 by $2\frac{1}{2}$. Spring eyes are bronze bushed. The front springs are provided with eight leaves and the rear with twelve.

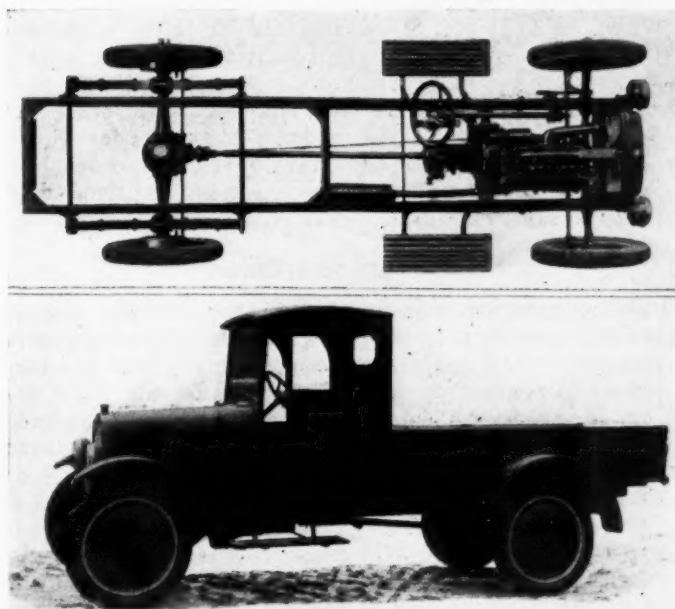
A bevel type of rear axle is used having spiral gears with a straddle-mounted pinion. Timken bearings are used throughout with the exception of the pinion shaft, which is carried on large type annular bearings. The rear axle is semi-floating and the axle shafts are $1\frac{7}{8}$ in. in diameter. The housing is of pressed steel reinforced by an inner sleeve. Housing ends are also reinforced by a large steel casting riveted to the ends of the housing on which are cast the spring pads. Access to the parts of the rear axle is given through the rear plates or by removing the pinion housing.

Service brakes are on the rear wheels. The drums are 14 by $2\frac{1}{4}$ in. and of the expanding type operated by a cam. The emergency brake is supported on the rear of the gearset, the drum being 8 by $2\frac{1}{2}$ in. It is of the contracting type and is fitted with expanding springs to prevent dragging.

The gasoline tank is concealed in the metal cowl and the instrument board is equipped with ammeter, oil gage, starting choke, dash light, lighting and ignition switches. The gasoline tank is filled through the ventilator in the center of the cowl and this opening also provides easy access to all wiring on the instrument board.

Tire equipment consists of 34 by $4\frac{1}{2}$ -in. pneumatics mounted on disk wheels, which are regular equipment and fitted with Firestone demountable rims. Stock bodies have an 8-ft. loading space.

Standard equipment includes among other things electric headlights, tail lamp, electric horn and tool kit. Points on the chassis requiring lubrication are fitted with oil gun connections and a pressure oil gun is part of the regular equipment. The price of the chassis is \$990.



Stewart 1-ton truck chassis and open express body equipment

Will Front Wheel Brake Equipment Help to Sell Cars?

May have effect in mountainous sections, where present systems are inadequate. Added price may be controlling factor in other localities. Motor vehicles thus equipped are less likely to skid if driver is skillful and brakes correctly proportioned.

By J. Edward Schipper

WITH the adoption of front-wheel brakes on several American passenger-car chassis close at hand, the intended installations are now going through a series of rigid final tests. From the present outlook they will cost the manufacturer at least \$25 per car on a quantity basis. While it will likely be late summer before any actual new models so equipped are announced, experimental models of at least a dozen of the manufacturers have been on the road for months with four-wheel brake equipment.

Not a few engineers are hesitant about the actual value of the new installation even though preparing themselves in case commercial conditions make it necessary to put the equipment on their cars. Nevertheless, front-wheel brakes are coming because the advantages outweigh the disadvantages.

There is more than one side to the front-wheel brake problem. The question, Will automobile users buy cars more readily because they are equipped with four-wheel brakes? is a natural one. The answer is apt to depend in part upon the section of the country in which the user is located. If he does a great deal of driving through mountainous country or even in territory which is quite hilly, an affirmative answer is likely. If he lives in a flat section of the country, it is quite probable that the answer would be negative, if an increase in price is involved. Under average flat country conditions, present braking systems are generally considered satisfactory. With front-wheel brakes properly installed and used, however, there is a marked reduction in the tendency to skid under slippery conditions. In fact, the advantage of the front-wheel brake in flat country probably lies much more in the reduced tendency to skid than in the increased stopping ability.

Present Layouts Inadequate

When cars are used in mountainous country, however, braking conditions as they now stand are admittedly unsatisfactory. Few engineers will not concede that the usual brakes as applied today are inadequate for mountain driving. Any automobile driver of even small experience knows that in order to successfully negotiate this sort of country, the engine must be used as a brake. The engine, clutch and gearset layouts as we now have them are not designed for this service. It is almost impossible for any but the most expert drivers to throw the gears from high to intermediate after a car has started rolling down a steep hill. The shift is usually accomplished, if the car has gathered considerable speed, at the risk of stripping the gears and possibly leaving the driver with a runaway car on his hands. In

the mountainous districts of the country accidents of this nature are frequent.

Braking ability is, of course, limited by frictional resistance between the tires and the ground. Since car weight is usually approximately 60 per cent on the rear wheels, if we add the two front wheels to our braking equipment, we increase the braking possibilities by about two-thirds, neglecting the moment that tends to throw an increased weight on the front wheels. The amount of heat that must be dissipated per square inch of drum area by adding drums to the front wheels is less for a given rate of retardation, or a given energy absorption.

Cost a Primary Objection

The objections to four-wheel brakes which are uppermost in the minds of engineers are, first, the cost of making a satisfactory installation; second, difficulty of properly proportioning the braking effect as between the four wheels; and, third, necessity for educating the drivers in their use. The cost of installation is a matter which cannot be disregarded in these days of highly competitive prices. If we take the arbitrary figure of \$25 per car and consider, for instance, an output of 10,000 cars per year, it represents an outlay of a quarter of a million dollars simply to make the installation. This does not take into consideration the complexities of servicing the new equipment and the necessity for redesigning the front axle and other units to accommodate the front-wheel brakes. Increased manufacturing costs are necessary in the front axle with the inclined king pin and other features made necessary by the front-wheel brake installation.

The question of proportioning the brakes and the brake mechanism so as to get a proper braking action is highly important and is the key to the entire success of a front-wheel brake installation. It is apparent that when front-wheel brakes are applied, there is a considerable moment tending to rotate the car about the points of contact between the front wheels and the ground. This moment naturally throws considerable weight forward to the front wheels and correspondingly relieves the weight on the rear wheels. If the brakes are of equal size and are applied with equal pressure, it is probable that the greatest amount of braking effort will be exerted by the front wheels. In this case, the rear wheels can lock while the front wheels are still rolling because of the reduced friction between the rear tires and the road. This leads to an unequal braking action, even though the layout is such that the brakes would otherwise be equalized. It is, therefore, easy

to put a car with front-wheel brakes which are not properly designed or are improperly adjusted into a dangerous front-wheel skid.

Many engineers favor hooking up the gearset brake with the front-wheel brakes so as to provide the rear wheels with the advantage of the increased leverage, due to the rear-axle reduction. Owing to the difficulties incident to securing a satisfactory gearset service brake, however, it

is doubtful if this will be favored by the majority. Some consider it more likely that the best proportioning will be worked out by varying the drum diameter of the front as compared with the rear, rather than attempting to utilize a gearset brake as a service brake.

The education of the driver to the correct use of four-wheel brakes is important if front-wheel skids and other accidents are to be avoided.

Warns Against Hasty Adaptations of Front Wheel Brakes

Ill-considered Installations Likely to Result in Serious Accidents, Which May Give an Undeserved Black Eye to a Meritorious Development

By A. Ludlow Clayden

IN many quarters there seems to be a conviction that it is simply a matter of time before front wheel brakes become universal. While this may be true it is sincerely to be hoped that their adoption will not be made hurriedly for they are liable to be extremely dangerous. Our industry has had small stampedes in various directions and has afterwards retracted, but none of the bursts of over-enthusiasm involved a feature of construction which affected the safety of the machine.

The fact which appears not to be realized is that if front wheel brakes are applied too hard on a curve a front wheel skid is inevitable should the surface be wet or soft, and there is no trick of the steering wheel that will correct a front wheel skid.

My first experience of front wheel brakes was twenty years ago, but the first time I saw them used seriously was in the Grand Prix of 1914. I well remember seeing Goux on one of the first practice mornings go clean off a dry road into the ditch, due to the front wheels locking. All the drivers in that race said that while the brakes enabled higher average speed one had to be very cautious in handling them.

A front wheel brake properly designed, reasonably well adjusted and used with intelligence is a magnificent aid to quick stopping and so makes for safety; but even given good design to what extent is it safe to rely upon the user and the average mechanic to make correct adjustments?

Put in another way this means that the compensation of front wheel brakes ought to be of a far higher order of merit than the average compensation of rear brakes. It also suggests that a safety device which will prevent both wheels being locked when on a curve would be a great safeguard. In some of the foreign designs, the Hotchkiss occurs to me as an example, the operating linkage is such that the outer wheel on a curve is braked less than the inner wheel, but the proper functioning of the arrangement depends upon sensible setting.

Perfect compensation is not easy to obtain mechanically and the only device which looks as though it would be foolproof in this respect is the hydraulic system, though even this in some installations can be muddled up by careless adjustment of the individual brake shoes.

Without doubt the safest method of braking is that in which the right front and left rear brakes operate together and vice versa, so that even if two wheels be locked there is still one free rolling wheel on each axle giving steering ability. The drawback to this system is the complexity of the linkage, which adds to the difficulty of proper adjustment; also one loses a little of the power obtained from a pair of front wheel brakes acting together.

In engineering one seldom finds anything new that is all plus and no minus, but the appreciation of the plus usually leads to the realization of the minus qualities of any innovation. I think the front wheel brake is coming and that the automobile is going to be a better and safer machine because of it, but I do think there is real reason for fearing that hasty adaptations may give front wheel braking a black eye with the public, the recovery from which might be a lengthy process.

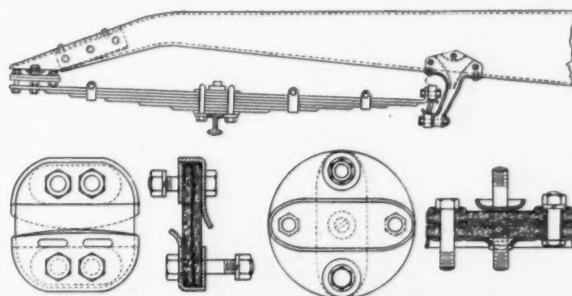
Pivot Type Fabric Shackle

IN addition to the tension shackle, constructed from fabric described in AUTOMOTIVE INDUSTRIES several months ago, the Belflex Corp. is now manufacturing another fitting termed the pivot shackle. It is intended for use on the end of the spring opposite to that on which the tension shackle is employed.

The pivot shackle, shown in the accompanying cut, is formed from circular disks of fabric, reinforced with steel stampings. It is arranged to fit between the spring bracket and the end of the spring. Two points near the ends of one diameter are attached to the frame bracket and two points near the ends of another diameter at right angles to the first are fastened to the spring. The pivot shackle is usually attached to the front ends of the front and the rear springs. It is normally under compression and acts as a cushion, tending to absorb shock. It also tends to relieve the spring from the twisting action to which it is sometimes subjected with the conventional shackle.

When Belflex shackles are employed, neither end of the spring leaf requires an eye, and since there is no motion between metal to metal parts, no lubrication is required, and squeaks and rattles are eliminated.

It is claimed also that this type of shackle lengthens the life of the spring, gives better riding qualities, requires no adjustment, and will outlast shackles of the conventional type.



Belflex pivot and tension shackles as applied to a semi-elliptic spring

New Conveyor and Oven Installation Cuts Enameling Costs

Only six men needed to enamel 5000 parts in normal working day. Maximum utilization of heat generated reduces operating expense. Process requires 2 hours 42 minutes for two coats and two bakes. Conveyor moves at rate of 26 inches per minute.

SIX men can perform all the human labor needed to enamel 5000 passenger car parts in a ten-hour working day at the Durant factory in Elizabeth, N. J. Each part goes through two dipping and two drying processes. This performance is made possible by a special conveyor equipment, which does all the mechanical work, and by a new type oven.

The installation has several features of special interest, chief of which is its wide adaptability. While the Durant schedule calls for 700 sets of parts per 13-hr. day, similar equipment and methods might be efficiently used in plants having a production as small as 50 cars per day. An inverted V-type oven which keeps the hot air from rushing through from one end to the other, a minimum direct labor expense and special electrical equipment are other items of special interest in this enameling installation. The enameling and drying processes for above schedule require 2 hr. and 42 min.

Parts to be enameled are put through the Durant plant in sets, one set consisting of the enameled parts necessary for one car. The main items in a set are front fenders, rear fenders, radiator hood, radiator shell, radiator guard, side aprons and mast jackets. There are a number of small parts in addition to these.

Before reaching the actual enameling process, these parts are handled much as in any automotive plant. Finished parts come to the plant from outside sources and are stored until ready for use.

The parts move from the stockroom to a Niagara washing machine, which removes the oil coating with an Oakite solution and a hot water bath. Sand papering and rubbing operations follow. The parts are then taken to the beginning of the enameling system.

Here they are handled by three men, none of whom is a skilled worker. One man removes the parts from a truck and gives them a final rubbing, that no dirt may be on the pieces when they are dipped. He also inspects them for cuts or blemishes which might prevent their taking a proper finish. Another man places the large parts on the conveyor rods, while the third handles small parts in the same way.

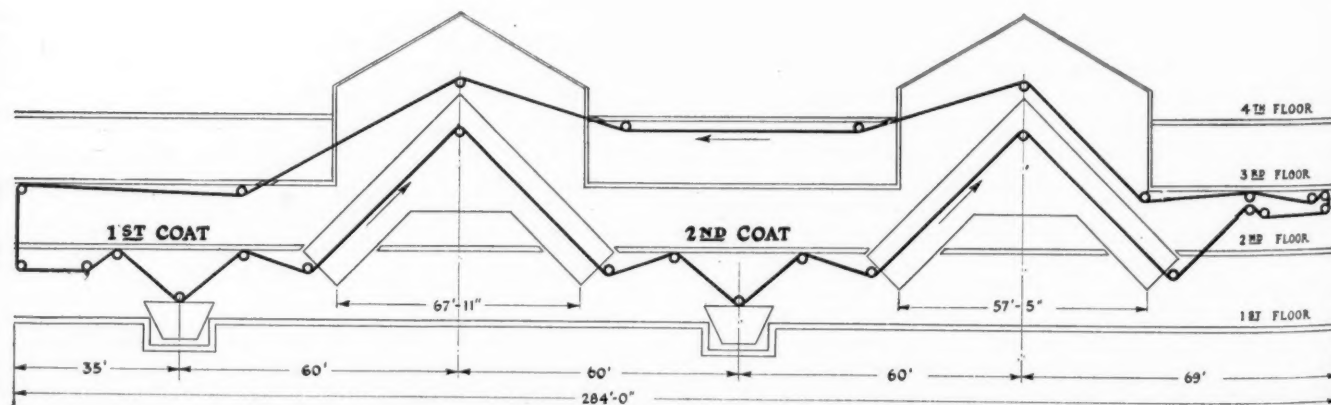
The conveyor is driven by a 10-hp. variable speed motor with speed reducer and pinion and gear drive. Only 3 hp. is required to drive the equipment. Highbake black enamel is used. No other colors can be applied by this process.

Process Takes Less Than Three Hours

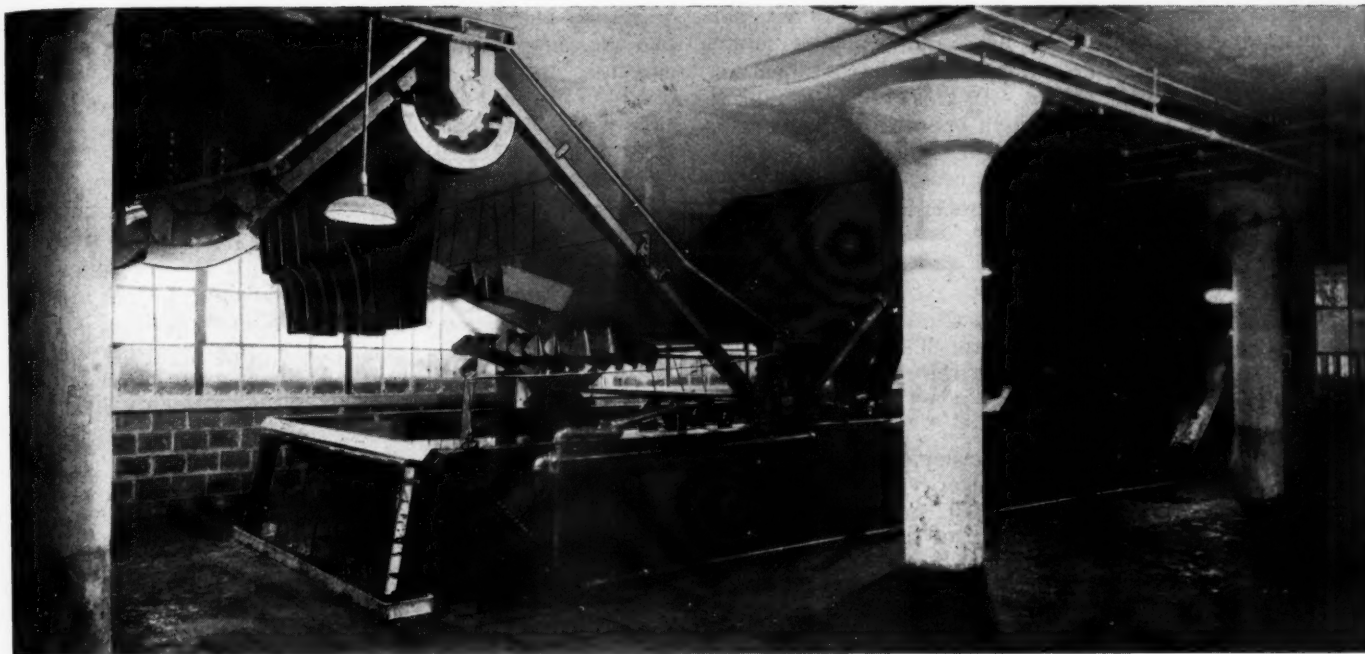
The accompanying diagram shows a general layout of the system. The pieces on the conveyor pass from the first enamel bath into the first drying oven, then to the finishing coat of enamel, and finally through the second drying oven. The time needed for a part to pass from the beginning to the end of the enameling process for maximum schedule is 2 hr. and 42 min., as noted previously. This time can be varied within certain limits, the baking temperature being lowered as the conveyor speed is decreased. The baking variation possible from the standard given is plus 3 hr.

The parts are cooled between the two ovens to temperatures ranging from 110 deg. to 125 deg. Fahr. Enamel drip is collected on inclined sheet metal drip pans and is led by pipes to enamel storage tanks.

Special features have been incorporated in this equipment as a result of specific study of the production problems involved. Comparatively low operating and maintenance costs have resulted from its use, according to Durant engineers. The particular shape of the oven, for example,



Layout of Durant enameling system



Parts entering second enamel bath. Oven lies at extreme right

is the result of less favorable experience in the past with straight tunnel ovens. The inverted V-type oven used here is so proportioned as to obtain maximum utilization of the heat generated. About one-quarter of the total time of bake is used in bringing the work into the high-temperature section, one-half of the time is used in moving it through that section and the remaining one-quarter in carrying it out of the oven.

The cost of keeping the ovens at a given heat has been reduced by recirculating air taken from the interior of the factory, instead of from the outside.

The counter-current system of ventilation is used. Fresh air is introduced at the exit end of the oven. There it comes in contact with the work which is leaving. A transfer of heat from the work to the entering fresh air takes place. The air is further heated by electric heaters, rises to the top of the oven and moves over to the opposite side where it comes in contact with the work that is entering. Another heat transfer takes place from the heated air to the cooler work.

The air slowly descends the oven leg and is exhausted at a final temperature of less than 175 deg. Fahr. Usually this exhaust temperature does not exceed 125 deg. Fahr., while the work leaves the oven at a temperature of about 150 deg. Fahr.

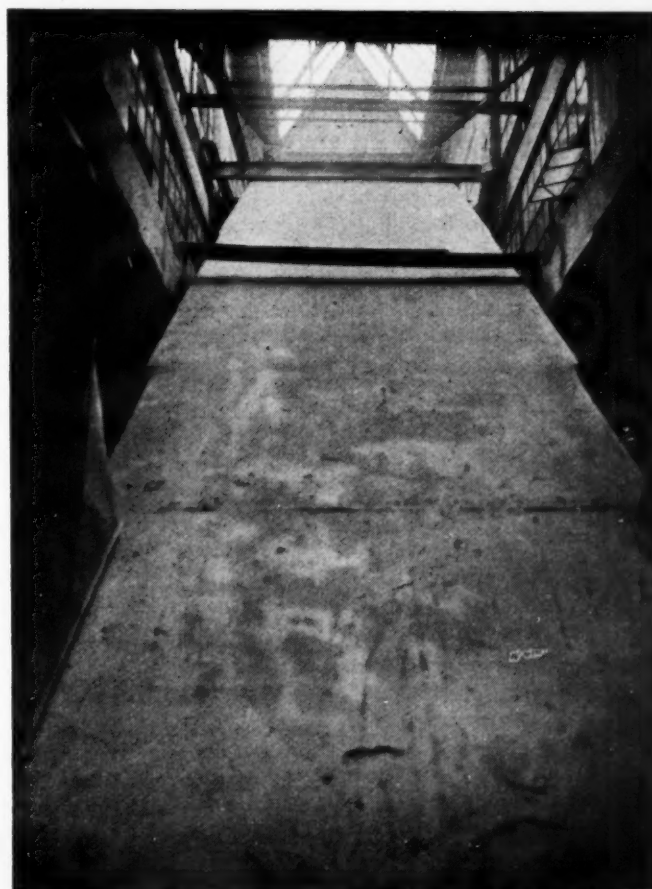
This efficient use of air produces highly satisfactory working conditions for the men as well as economies from a cost standpoint. Very hot air and fumes are kept in the top of the furnace to a large extent, with the result that the rooms containing the enameling vats are practically free from unpleasant odors. The enameling rooms offer as pleasant working conditions as almost any other part of the plant. No attempt is made to regulate the moisture content of the air. The air is cleaned before circulation by an oiled cloth stretched over the fan inlet.

Oven Insulation Reduces Heat Loss

The ovens are insulated with 3 in. to 6 in. of 85 per cent magnesia, in air space and plaster. Heat transmission loss through the walls of the high temperature section is less than 1/10 B.t.u. per sq. ft. per degree rise per hour. The actual heating surface in this flat section at the top of the oven.

This economical utilization of air, coupled with specially designed electrical equipment has made operating costs low. The ovens have not yet been run at full capacity, but their actual performance thus far indicates that they will deliver 80 lb. of automobile sheet metal thoroughly baked at 475 deg. Fahr. through two bakes for a power cost of 7 kilowatt hours.

Assuming that one set of metal parts weighs 80 lb., ovens



Top of enameling oven which extends to skylight

of this kind at full capacity are said to deliver 50 sets per hour at an average electric cost of 250 kilowatts per hour.

Each oven has 42 C.M.S., Inc., 5-kw. 254-volt heaters. These have a capacity of 210 kw. Of this capacity, 120 kw. are installed in a base bank which operates continuously, and 90 kw. are installed in a control bank which operates intermittently and controls temperatures.

Leeds & Northrup potentiometer recorder controllers are used for temperature regulation.

The entire enameling equipment was designed and installed by C. M. S., Inc.

The pieces remain in each oven for 43 min. The conveyor moves at a rate of 26.2 in. per minute. The general dimensions of the equipment are shown in the chart. The ovens themselves are 94 ft. long. Forty-seven bars filled with parts are always in each oven.

The bars connecting the conveyor chains are spaced 24 in. apart. To turn out the necessary 700 sets of parts each day, 849 bars are needed, while the conveyor chain must move through a distance of 1697 ft. On each bar there is hanging space of 10 ft. 7¼ in.

Special hooks are used for hanging each type of part, and the sequence of parts hung on following bars has been carefully worked out. Consequently, the bars carry a maximum load at all times. This hanging sequence applies chiefly to the major parts, which would touch one another if improperly placed. The small parts are fitted in between the larger ones without special arrangement.

Following is the arrangement that has been worked out for hanging the larger parts at the rate of 500 complete sets per 10 hr. day:

Front fenders	18 on every other bar
Rear fenders	10 on every other bar
Radiator hoods	14 on every other bar
Radiator shells	21 on every other bar
Radiator guards	19 on every other bar
Side aprons	28 on one bar
Mast jackets	43 on one bar

When the parts reach the end of the enameling process, they are handled by three more men. The task of these workers is similar in general to that of the men who place the pieces on the conveyor at the beginning.

New Milling Machine Has Automatic Spindle Control

A NEW milling machine, designed especially for automatic milling of duplicate parts in large quantities has just been placed on the market by the Brown & Sharpe Mfg. Co. This machine is fitted with an automatic oiling system, and the ways are said to be exceptionally wide and heavy.

The unique feature of the machine is the automatic control of the spindle and table by means of dogs located at the front and rear of the table. The variable feed and constant fast travel, as well as the stopping of the table can be automatically controlled by properly setting these dogs. The dogs also provide for automatically actuating

the spindle starting, stopping and reversing controls. The table and spindle can be operated independently of each other, or can be worked in conjunction. The spindle can be set to run continuously in either direction or can be set to stop and start in conjunction with the table movements. The spindle reverse is entirely independent of the table reverse.

The design is such that the table can be stopped while it is on its return travel, thus eliminating the possibility of marring the work by allowing the cutter to run back over the surface machined on the forward movement of the table. The provision for reversing the spindle allows the use of two sets of cutters with teeth facing in opposite directions so that cuts can be taken on both forward and return movements.

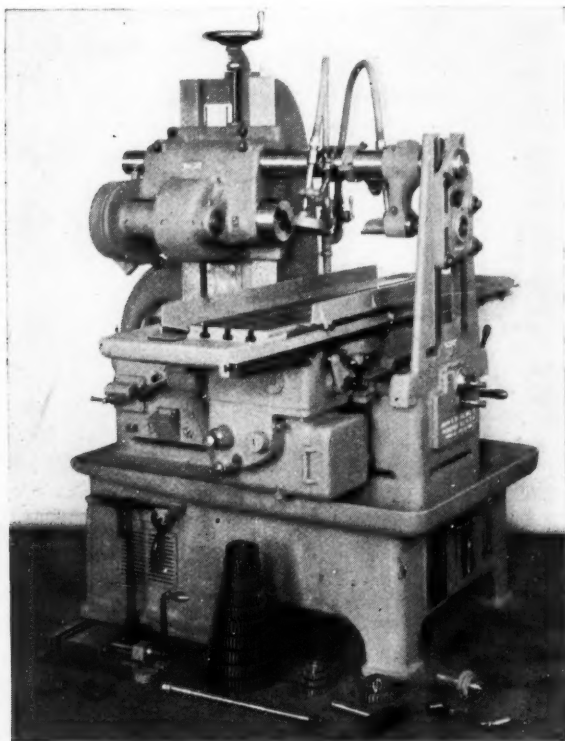
Constant fast travel in combination with slow variable feed can be controlled automatically with the table running in either direction. This feature, together with independent automatic control, of the spindle, will permit of automatic machining of many duplicate pieces on a production basis. On duplicate milling jobs, where the loading time is approximately equal to the cutting time, this machine will turn out, it is claimed, approximately twice the amount of work in a given time as will a machine that is designed for milling at one end of the table only.

The drive in the machine is from a single pulley running at constant speed and the controls are entirely within the machine. The advantage of this constant feed type of drive is the complete separation of the spindle feed and table feed, permitting any combination of the two within the capacity of the machine.

Cutting lubricant is pumped to the work from a large tank cast in the base of the machine, and two nozzles are provided and arranged in such a way that one or both can be used, depending on the number of cutters employed.

The 14 x 4½ in. driving pulley is intended to run at 350 r.p.m., and at this speed the 12 available spindle feeds range from 22 to 180 r.p.m.

This machine, which is known as No. 33, has a longitudinal feed of 34 in. and a transverse adjustment of 5¼ in.



No. 33 Brown & Sharpe automatic milling machine

Front Wheel Drive Truck Features Gearset with Hydraulic Control

Advantages said to be freedom from skidding, low unsprung weight and ability to use exceptionally low body. Specially suited to bus purposes. Small cone clutches on each gear prevent clashing and take place of usual flywheel clutch.

By Benno R. Dierfeld

ONE of the most interesting truck chassis now being produced in Germany is a 3-ton model recently brought out by The Lippische Werkstätten, a concern which has acquired patent rights and design developed by Mayer-Ulm.

The design incorporates a novel type of hydraulically operated gearset, which is connected directly to a 30 hp. four-cylinder engine. From the gearset the drive is taken by spur gears to a differential and then by two shafts with universal joints to pinions operating in internal gears attached to the front wheel.

The advantages of this construction are said to include freedom from skidding and a lower weight than is usual with trucks of conventional type. In addition there is the advantage of comparatively low unsprung weight, a body space which is entirely free from driving mechanisms, and a construction which permits the use of a drop type, dead rear axle and consequently a much lower body than is possible with the conventional type of chassis. The resultant low center of gravity gives the vehicle greater stability than would otherwise be possible. The type of chassis in question is said to be especially suitable for bus purposes.

As will be seen by the accompanying cut, the engine is arranged in the usual position at the front end of the frame. It has 75 mm. bore and 140 mm. stroke and is said to deliver 30 brake hp. at 2000 r.p.m. The cylinders are cast in a single block and are siamesed in order to reduce overall length.

There are three rings above the pin and an oil scraper ring near the bottom of the skirt. The pins are secured in the piston by set screws and the upper end of the connecting rod is bushed with bronze to turn on the pin. The piston head is ribbed and is concave as viewed from the top.

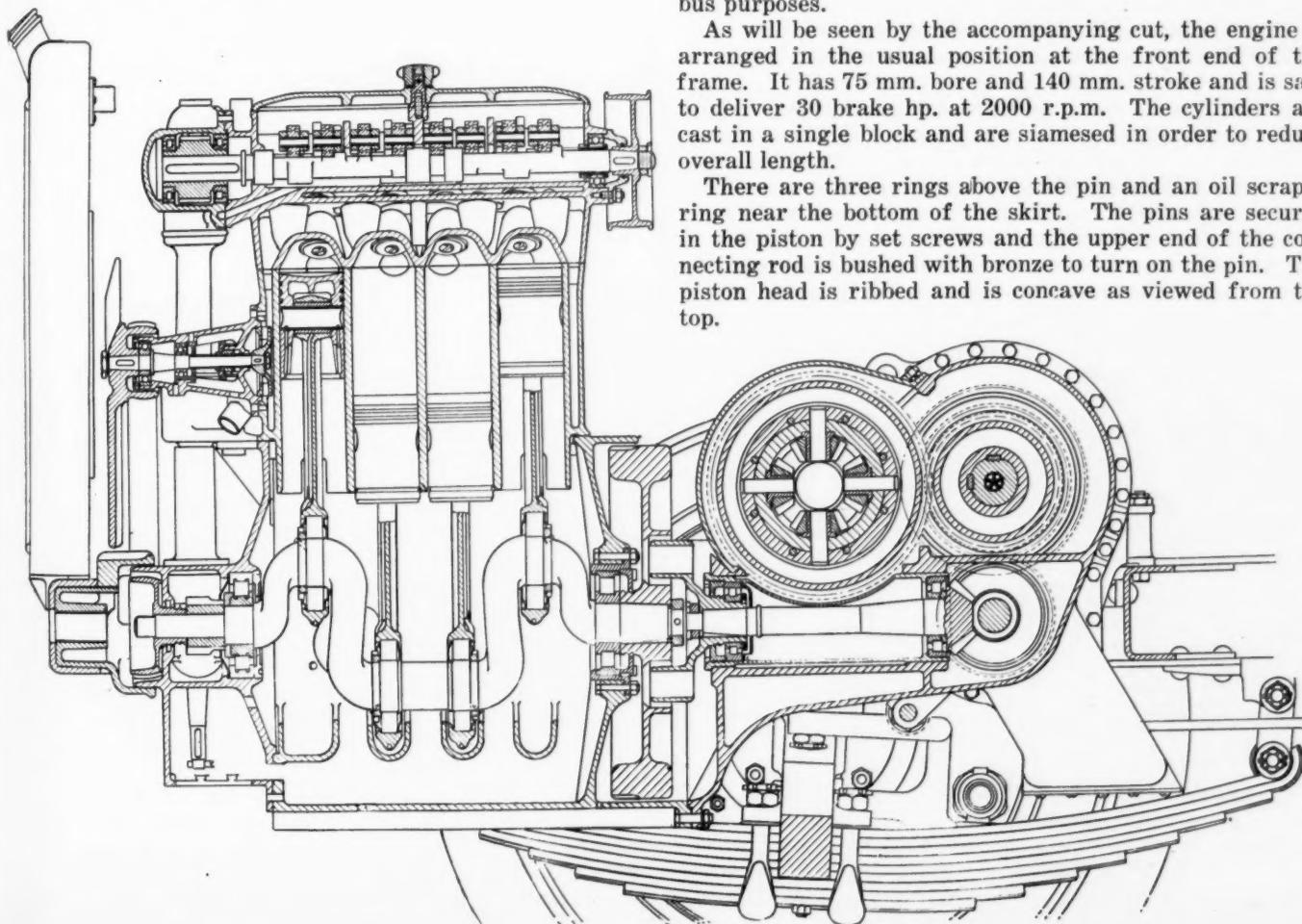


Fig. 1—Vertical section of the Lippische engine showing the bevel gear drive to the gearset

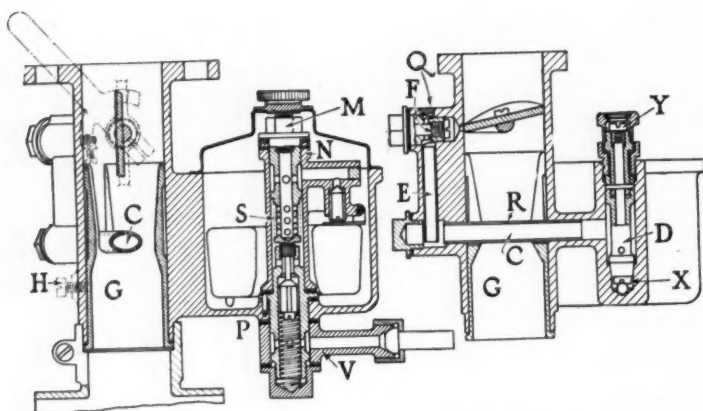


Fig. 2—Sectional view of the Graetzin carburetor

A construction which is rare in the case of German truck engines is the use of a crankshaft having but two straight roller type main bearings. Roller bearings are also used on the big ends of the connecting rods.

Valves are inclined and arranged in a detachable cylinder head. They are operated by rocker arms from an overhead camshaft, running in ball and roller bearings and driven by a vertical shaft and helical bevel gears from the front end of the crankshaft. A pulley on the rear end of the camshaft is used to drive the lighting generator. The valves and their driving mechanism are completely enclosed by aluminum cover plates, as will be seen by reference to Fig. 1.

The radiator fan is driven by a flat belt from the front end of the crankshaft and has a live spindle, the inner end of which terminates in a pump for circulating the cooling water. The fan is in the form of a three blade aluminum casting, arranged to cool a flat tube radiator.

Oil is circulated by a pump, driving off the lower end of the vertical shaft which drives the camshaft. The big ends of the connecting rods are fitted with oil scoops arranged to dip into troughs and the piston pins are fed from tubes attached to the connecting rod. A vertical section of the engine and the shaft connecting it direct to the gearset is shown in Fig. 1.

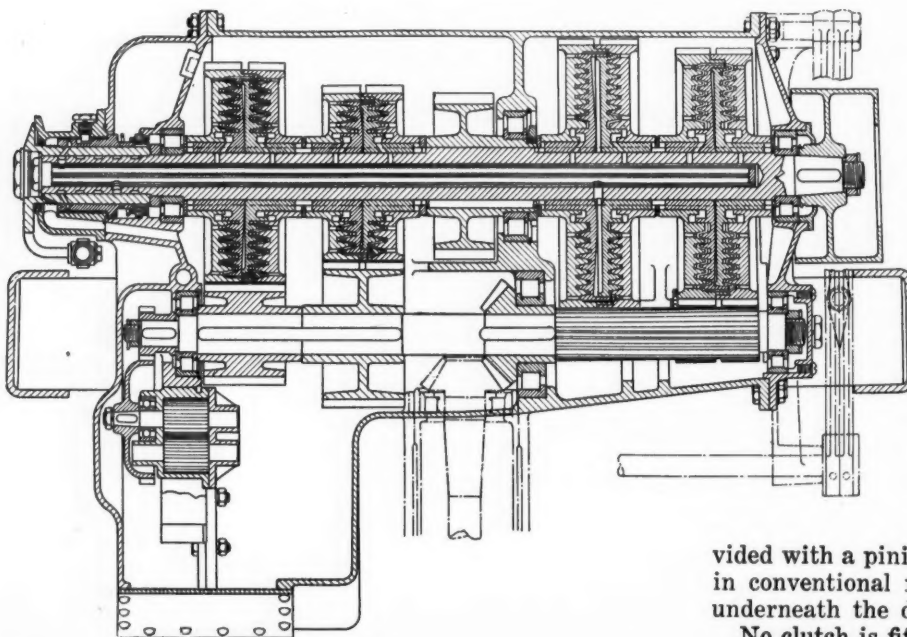


Fig. 4—Hydraulically operated gearsets showing the oil pump, oil distributor and the combined clutches and gears for the various speeds

The engine is fitted with a Graetzin carburetor, the feature of which is its accessibility, simple construction, and adjustment. Sectional views of the carburetor are shown in Fig. 2. If the float, with its support N is removed fuel is shut off automatically by closing of the valve P, thus avoiding loss in fuel. Valve P can be opened by pressing down on the part M if it is desired to determine whether the fuel is flowing freely. The cover of the float chamber is easily removed without disturbing the float mechanism.

The float level is controlled by the position of the float support N, which in turn depends upon the thickness of the washer used above or below it. Such a change in adjustment is not required, however, except when heavy fuels, such as benzol-tar oil mixtures are employed. The fuel pipe fitting V is so arranged that it can be turned about the center line of the float. The fuel is filtered by a strainer S which can be easily removed and cleaned.

The fuel jet body D has on its lower end the fuel jet X,

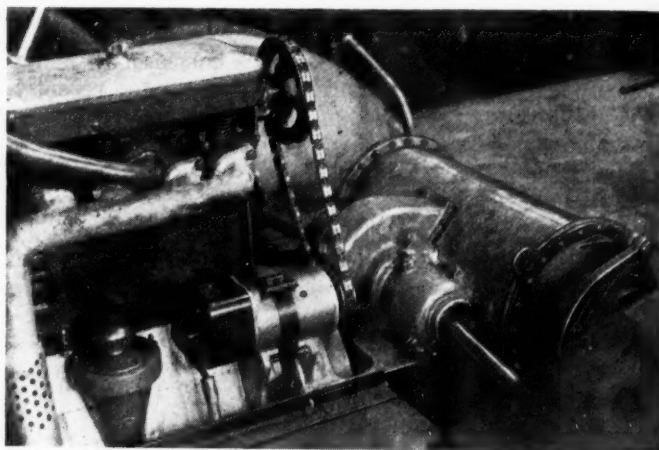


Fig. 3—Engine and gearset showing the shafts which drive each of the front wheels

and on its upper end the correcting jet Y. Both of these, as well as the idling jet F can be interchanged, giving various combinations of adjustment. The idling jet draws fuel through the tubes E and C, the latter forming a sort of well with opening R. The well of fuel in C is intended to assist in acceleration. When relatively non-volatile fuels are used in cold weather, the plug Q can be replaced by a small pipe connection for light fuels used in starting. The venturi tube G can be readily replaced by one of another size after loosening screw H.

Fuel is fed by gravity from a tank located under the driver's seat. The Bosch magneto has an automatic advance mechanism and the Bosch lighting generator is arranged on the left side of the crankcase and is driven by a belt of V type as shown in Fig. 3. A Bosch starting motor is mounted on the right side of the crankcase, and is provided with a pinion meshing with the gear on the flywheel, in conventional fashion. The storage battery is located underneath the driver's seat.

No clutch is fitted in the engine flywheel. The power is transmitted by a flexible coupling to a short shaft running in two roller bearings and terminating in a bevel pinion which meshes with a bevel gear on the lower or main shaft

of the gearset as shown in Fig. 1. Keyed to this shaft are four wide spur gears which give three forward speeds and one reverse. A small gear at one end of the same shaft is also provided to drive the gear type oil pump which operates continuously when the engine is running. This arrangement is shown in Fig. 4. This pump draws oil from the bottom of the gearcase and delivers it into a chamber containing air under pressure. From this chamber the oil flows under a pressure of about 30 lb. (as indicated by a gage on the dash) to a cylindrical distributor arranged on one end of the upper shaft of the gearset.

From the distributor the oil passes into piping arranged inside the upper gearset shaft to the hydraulically operated clutches which are inside each of the four wide face constant mesh spur gears, carried on this shaft. Each of these gears is made in two halves which are fastened together and each completely encloses a clutch.

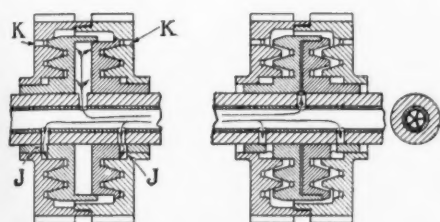


Fig. 5—Diagram showing the gear with hydraulically operated internal clutches. Arrows indicate the direction of oil flows when the clutches are engaged and disengaged

Within the shaft carrying the gears and clutches there is one cylindrical brass tube, into which are fitted five sector shaped tubes. The tubes communicate respectively with the internal pressure chamber of each of the clutches, while the common tube connects to all of the outer chambers of the clutch. The two interior parts of the clutch are splined to the shaft. They are made of bronze and have circumferential tapered grooves the faces of which form conical surfaces which mate with corresponding surfaces on the inner wall of the two outer halves of the steel gear. Oil is admitted under pressure to the space between the two halves of the clutch which are thus forced apart in an axial direction and engage with the two halves of the gear. The parts form, in effect, a series of concentric cone clutches the engagement of which causes the gear to turn with the shaft to which the clutches are splined.

When the clutches are disengaged, the gears turn freely about the clutch hubs. To disengage the clutches, oil is admitted to the space between clutch and gear and is released from the space between the two halves of the clutch. Thus by simply turning the distributor to the desired position, the operator selects the gear which gives the required reduction.

The holes K, Fig. 5, serve to let the oil out from the space between the conical faces of the clutch and gear members. A photograph of the gear and clutch is shown in Fig. 6.

Each of the shafts in the gearset is carried on three cylindrical roller bearings. The pinion at the center of the upper shaft meshes with a spur gear on the differential. On the end of the gearset shaft, opposite to that on which the distributor is located, there is, outside the case, a gearset brake.

The reverse is effected in the usual

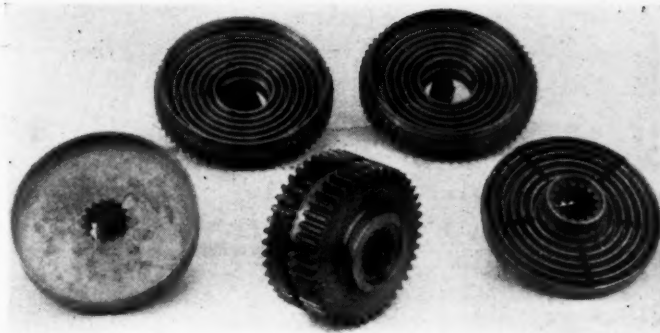


Fig. 6—Gear with concentric internal cone clutch operated by oil pressure

manner by the use of an idler gear, but the latter is in constant mesh with both the other gears. The pressure used for holding the clutches in engagement varies from 20 to 30 lb.

After removing the cover shown at the left end of the drawing of the gearset, either of the two gearset shafts can be withdrawn. The differential, seen clearly in Fig. 7, is carried in two roller bearings. This shaft is located just forward of the gearset, as can be seen in Fig. 3. From the differential the drive is taken through two enclosed metal universal joints, two shafts and two flexible disk joints, to the pinions which drive the internal gears attached to each of the front wheels, as shown also in Fig. 7.

The front wheels are steel disk castings and are arranged to run on one roller and one ball bearing. The axis of the wheel spindle is slightly inclined from the horizontal and the axis of the steering knuckle spindle is also inclined, so that its prolongation meets the ground in the central point of tire contact. This axis also passes through the center of the flexible disks universal joints, so that steering is said to be very easy. The driving pinions are mounted on one ball and one cylindrical roller bearing.

Steering is by a conventional worm and worm wheel.

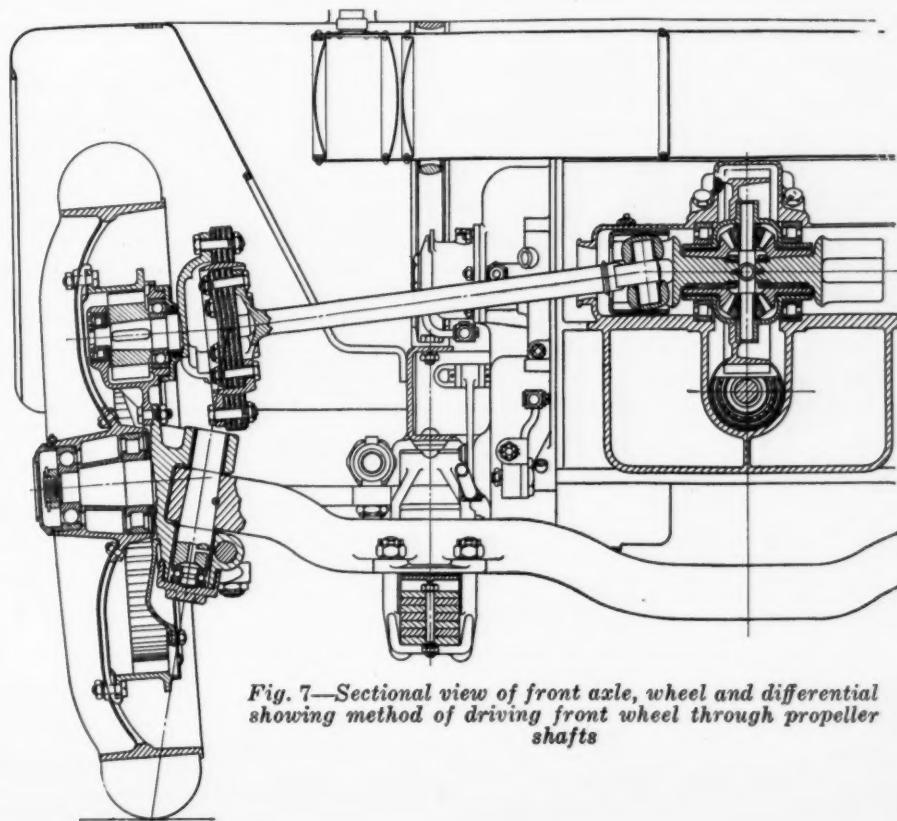


Fig. 7—Sectional view of front axle, wheel and differential showing method of driving front wheel through propeller shafts

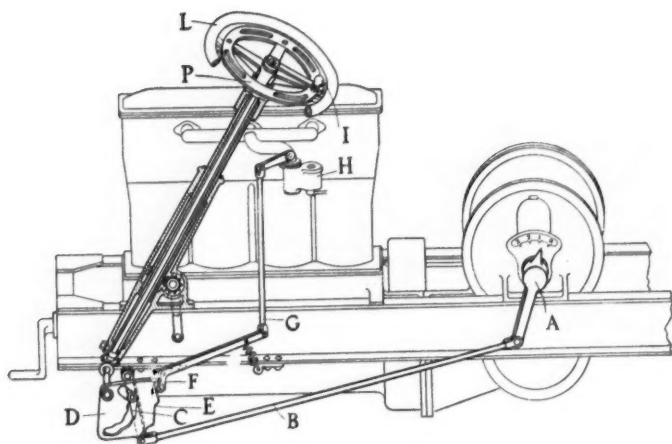


Fig. 8—Diagram showing inter-connection of hydraulic gearset control and throttle

Above the steering wheel is mounted the lever which operates the oil distributor and controls the gearset. The front axle is a reverse Elliott type and the axle center has a square section. The steering knuckle is provided with a ball thrust bearing.

The gear shifting mechanism and the throttle control are interconnected in the manner shown diagrammatically in Fig. 8. The steering wheel *L* surrounds an interior stationary concentric ring in which are four slots, corresponding to the three forward and the reverse speeds, and three holes corresponding to intermediate neutral positions. The shifter lever *I* moves over this ring and operates, by means of a shaft in the hollow steering post and bevel gears a horizontal shaft carrying the cam disk *D* with a specially shaped slot *C* and a curved exterior edge *E*. Against the latter bears the roller *F* connected by a spring loaded linkage *G* with the throttle valve of the carburetor *H*. The roller running in the slot *C* of disk *D* operates a lever connected to the rod *B* and the control lever *A* of the gearset distributor. This lever is shown carrying a pointer which

swings over a dial with numbers corresponding to the slots and neutral positions on the control lever ring *I*.

By use of the cam plate *D*, the throttle is controlled automatically in accordance with the position of the gear shift. By virtue of this arrangement and the hydraulic clutches, it is possible to pass directly from one forward speed to any of the other speeds, and even, in case of emergency, into reverse, thus providing a powerful braking action.

Among the advantages of the type of hydraulically operated gearsets, may be mentioned the ease with which shift from one gear to another can be made. This is accomplished, as explained, by simply turning a single control lever around a quadrant. All clashing of gears is avoided and it is possible to use the reverse as the brake in case of emergency. The clutches are of small diameter, and run in oil so that the coefficient of friction is low. On the other hand, the hydraulic pressure over the entire area of the inner face of the clutch, is sufficiently high to permit the necessary torque to be carried without difficulty.

Since no foot operated clutch is required, there are two brake pedals provided. One operates on the gearset, as mentioned above, gives front wheel braking and the other operates on drums attached to the rear wheels.

The power plant is suspended by three points from the channel iron frame. All springs are of semi-elliptic type and are underslung.

The truck to which the power plant described is fitted has 122 in. wheelbase, 63 in. track, 29.5 ft. turning radius, 13.8 in. ground clearance and 23.6 in. frame height. The useful load capacity is given at 6620 lb. The weight of the truck empty is said to be 4970 lb. and loaded ready for service 5220 lb. Load on front axle, truck light, 3480 lb., load on rear axle 1740 lb. Truck loaded, weight on front axle 5280 lb., weight on rear axle 6620 lb. The truck is fitted with 880 x 140 mm. tires and is capable of a speed of 13.7 m.p.h. At the time this article is written, the American rights for the patent governing the construction of this truck have not been disposed of.

Hendey Places Cone Headstock Motor Drive on Market

A CONE headstock motor drive of compact design has been developed by the Hendey Machine Co. and placed on the market to be used in conjunction with their 12, 14, 16, 18 and 20 in. lathes of old and new design.

The countershaft unit consists of a base bracket clamped to the V of the lathe bed at the rear of the headstock. It is secured further by cap screws entering the lower part of the bed. The drive may be attached to a lathe in the field as no machine work is necessary. Attaching is done by drilling and tapping two holes in the lower part of the bed.

The countershaft bracket is hinged to the main casting and carries tight and loose pulleys belted direct to the motor pulley (the loose pulley running on ball bearings), a complete inclosed reducing gear and countershaft with cone pulley. Tight and loose pulley as well as the motor pulley are inclosed in cast iron guards with belt openings.

By means of quick operating toggles and a hand lever the countershaft and cone pulleys are moved toward or away from the lathe spindle, thereby loosening or tightening the belt. Screw adjustments regulate the tension of belt or stretch incident to the use of leather belts.

A motor base with platform is provided, suitable for the motor selected. The platform, secured to the base proper by a large hinge pin at one end and adjustment screws at

the other, provides a means of keeping the motor belt at desired tension. The main casting of the motor base is bolted to the floor within the floor area allotted to the lathe proper.

A constant speed A.C. or D.C. motor, operating at 1200 r.p.m., is recommended for use with this motor drive but lower speed motors and those operating at a speed as high as 1800 r.p.m. can be used.

THE well known work "Metallic Alloys" by William T. Brannet has been superseded by a new volume using Brannet's work as a basis. The author of the new volume is Charles Vickers and the title has been changed to "Metals and Their Alloys," to be more descriptive of the contents.

Much new material has been added and the entire work has been brought up to date. Information on the subject of magnesium alloys is presented for the first time, also material on monel metal, die-castings and foundry uses of scrap metals.

Presentation of information in a clear and concise manner makes the new volume of practical value to shop workers as well as to metallurgists, chemists and others whose interest lies in this field.

Careful Choice of Machine Tools Makes Lower Costs Possible

Time element not sole factor. "General special purpose" tool a constructive development. Up-to-date cost records help to gauge performance. Correlation between market analysis work, production and purchasing, tends toward efficient management.

THOUSANDS of dollars can be saved in automotive production work by more careful selection of machine tools, according to A. J. Baker, chief engineer of the Willys-Overland Company. Too often tools are bought with only the time element in mind, Baker thinks, when, as a matter of fact, rate of production is only one of a number of important factors involved. The single piece tool may do a particular job very rapidly, but it often imposes other limitations on production that outweigh the value of the time saved.

Careful analysis should precede investment in tool equipment whenever possible. Studies of tool performance, layout and operating cost should be kept under way continuously so that when a sudden need for additional equipment arises, data will be available upon which to select it intelligently.

Accounting departments should develop cost records that will be of practical value to the manufacturing department. Otherwise, unit costs and individual tool performance cannot be accurately gaged.

Correlation of market analysis work with purchasing and production will go far toward lowering manufacturing cost. The extent to which the sales department can affect production costs is not generally recognized. Lack of detailed and accurate territorial studies reflect in high manufacturing cost and inefficient buying. Production departments too often find it necessary to discount the enthusiastic estimates of demand made by the sales departments when money is actually to be spent in providing new manufacturing facilities.

The foregoing statements contain the substance of remarks made by Baker in an interview given to AUTOMOTIVE INDUSTRIES. Commenting further upon machine tools and automotive production, Baker said:

"Limitations of the single piece machine tool should be thoroughly recognized before large sums of money are invested in it. The special purpose tool, for example, limits changes in design very materially. This point is particularly important from the standpoint of the design-

ing engineer and the sales department. When special tools have been installed, capable of producing only a certain part, even a slight change in the design of that part means the scrapping of thousands of dollars worth of equipment. Progress in design is materially retarded as a result. Before single piece tools are purchased the engineer should be very certain that no change in design is likely to be desirable for some years to come.

"Special purpose tools naturally have little resale value. Having been designed for a specific function they are useless for work of any other kind.

"The first cost of such tools is very high. Especially is this true when the element of reliability is considered. It is no reflection on machine tool designers to say that it is very difficult to build a special type tool so that immediately it will perform reliably over a long period of time. In the very nature of the case, the designer has no precedent and no previous experience to guide him as he would in designing a new general purpose tool. As a result, high up-keep costs, high installation costs and uncertain service have frequently gone hand in

hand with the highly specialized tool.

"Moreover, skilled workmen are usually needed to set up, operate, and service this special equipment. Frequently, workers of this kind are not readily available.

"The special purpose tool has a very definite value, of course, in certain instances. I have simply emphasized its limitations because there has been some tendency in the automotive industry to evaluate it too highly. Chiefly I want to point out the necessity for considering every one of the elements involved when machine tool equipment is being bought. In order of their importance I would list these elements as follows:

1. Possibility of rapid delivery. Equipment of this kind is usually needed in a hurry and if it is not immediately available, it is useless.
2. Cost of equipment. This includes the actual price of the tool, the cost of its installation, foundations, etc.

RISING material costs and competitive pressure within the industry make the subject of production economies one of first consideration to the automotive executive.

In an interview given to AUTOMOTIVE INDUSTRIES, A. J. Baker, chief engineer of the Willys-Overland Co., made some pertinent statements in regard to reducing manufacturing costs through careful choice of machine tools. His opinions and suggestions are given in this article.

3. Distribution of price over the number of parts that are to be produced.
4. Scope of work that machine is capable of doing. Is it adaptable to modifications in design? Can it be used for more than one purpose if production demands necessitate swinging it from one job to another?
5. Special equipment necessary to go with it. Does it require expensive tools and dies?
6. Probable maintenance cost.
7. Does its operation call for special training on the part of the operator? Is the labor supply readily available?
8. Does the tool require anything special in the way of set-up? Special requirements mean that continued inspection will be necessary.
9. Necessity for frequent repairs. What resources are readily available for putting the tool back in operation if it breaks down?
10. Power requirements, floor space necessary, etc.
11. Re-sale value of old machinery which is to be replaced.
12. Probable re-sale value of new equipment at end of its useful life.

"Emergency conditions can be provided for in advance, to some extent, by keeping men constantly at work on internal standardization, shop lay-out, machine cost studies and analysis work of similar character. The trouble is that there is little time for work of this kind when production facilities are being pushed to the limit. Then, in times of depression the first men likely to be laid off are those who are engaged in analytical production studies of the kind just mentioned. This was the case during the depression in 1921 so far as the industry in general was concerned.

Market Analysis Aids Cost Cutting

"Extending the scope and increasing the accuracy of market analysis studies would aid the engineering department materially in its efforts to cut production costs by stabilizing the output curve and making adequate provision for probable future demands. It is evident, of course, from the sales angle that there is very great value in being able to predict, with some reasonable degree of accuracy, how many cars are going to be sold during the next six or twelve months. In reckoning the work and expense involved in making sales analyses, however, their value to the production and engineering departments should be considered, as well as their immediate merchandising value.

"The present tendency toward nickel on radiators and other parts of the car is a good example of the type of design for which the production department may be wise not to provide permanent facilities. It would be taking a chance to install expensive nickel plating equipment to turn out all the nickel plating work that is likely to be

necessary during the next six or twelve months, because there is a very good chance that nickel trimming on cars is merely a passing fad. In such a case, it is better to get the work done as well as possible with the equipment available than to make large investments in new equipment for which there is very likely to be no use at the end of a comparatively short time.

"The production department has not been given sufficient consideration in the preparation of accounts and costs. The accounting department usually makes up its records so that they are entirely adequate from a financial standpoint, but very frequently they are almost useless to the man interested in unit production costs and individual machine tool performance. There should be a much larger measure of consultation and cooperation between the accounting and production departments if the best results are to be obtained.

"General Special Purpose" Tool Development

"There does not seem to be any immediate cure-all for the machine tool situation, but there is a very definite opportunity for immediate improvement.

"A certain degree of specialization in machine tool equipment is absolutely necessary. The most constructive development to be noted at the present time is in the direction of what might be called the 'general special purpose' tool. By this term is meant a tool which is specially designed for a certain limited number of operations, but which is not confined to a single piece.

"Just what tools of this kind are needed can be determined only by a general canvass of automotive production men. Such a canvass is constantly taking place, of course, through the salesmen and representatives of the various machine tool builders. The process, as it is now carried on, is pointing in the right direction, but it is comparatively slow. Active cooperation on the part of automotive production men would give considerable impetus to this constructive movement.

"Cooperation might take the form of a practical discussion of this specific question at S.A.E. production meetings. As a result of a series of discussions of this kind, the most immediate needs of the industry might be clarified and brought to a focus. The machine tool builders would then be in a better position to proceed with their development work.

"Standardization in the machine tool industry is essential to a proper development along the lines indicated. The benefits of standardization in the automotive industry are too well known to need repetition here. Similar simplified practice in the machine tool industry would go far toward reducing the production cost of automotive vehicles, and would bring back to the machine tool builders all of the benefits that have accrued to other industries from the same source."

N. G. S.

Research Material Given Out in Recent Publications

SOME little time ago the Federated American Engineering Societies appointed a committee to make a study of work periods of labor. The results of this study have been published under the title of "The Twelve-Hour Shift in Industry" by E. P. Dutton & Co. Anyone making a study of the problem of work periods would do well to read this report which deals with the subject from both the economic and humanitarian standpoint.

The committee concludes from its widespread survey and study that the eight-hour shift is more productive than the twelve-hour shift. It maintains that productive loss may occur if the transition to the eight-hour shift is made without careful planning.

USE of plastic materials has increased greatly within recent years. No day goes by without our using some commodity made wholly or in part from plastic materials. Their universal scope will be appreciated better after reading "Plastics and Molded Electrical Insulation" by Emile Hemming, recently published by The Chemical Catalog Co., Inc., New York.

Hemming discusses the entire field of plastics and at the end of each chapter he gives a résumé of the patents which bear on the particular materials or processes discussed.

The author of this work has been actively engaged in the manufacture of insulation for many years and was responsible for the introduction of cold molded insulation.

French Makers Are Experimenting with Fabric Covered Bodies

Weymann plant now in full production on new model sedan of exceptionally light construction. Talbot-Darracq and Citroen also making some bodies of this type. Use of wire and buckram as foundation for leather cloth has not given good results.

By W. F. Bradley

AFTER three years' experimenting, the Weymann Body Co., of Paris, is now in full production on a patented type of wood and fabric sedan having exceptional claims in the matter of light weight and absence of noise. A license has also been taken up by the Talbot-Darracq Automobile Co. for the production of these bodies in its own shops, in France.

Weymann claims to be the first to make exclusive use of fabric in closed body construction, for he produced his first body in 1920, and has built experimental models continuously since that date. Quite recently he purchased the Duvergne body building works and transformed them for building custom bodies of wood and fabric according to his patented methods.

Unlike attempts in America to use fabric for closed body building, Weymann breaks away completely from the conventional body frame and with his construction establishes strong claims for low weight and absence of noise both when new and after considerable running. Up to the present the factory has interested itself in high grade custom bodies, which only have to compete, in price, with the best closed bodies on conventional lines. The type of construction, however, seems to lend itself to cheap production, and probably this feature will be more strongly developed in the bodies built in the Talbot-Darracq shops.

A five-passenger sedan body fitted to a Chenard-Walcker 15 h. p. chassis, and having the following internal dimensions: width 44 in., height 45 in., length 110 in., weight only 440 lb. This weight comprises the complete body with full running boards, broad fenders, lamp brackets, double windscreen, two plate glass windows at each side, rear window, and all body accessories, and represents the difference between the weight of the car as it entered and as it left the body works. The wood frame, running boards and four fenders, together with all iron work, total 154 lb. The weight of plate glass in a sedan having three windows on each side, averages 80 lb. Dimensions being equal, a Weymann closed body weighs much less than a normal open body built on conventional lines.

The Weymann type of construction is feasible because weight of the passengers is carried directly on the chassis frame members, no portion of this weight being on the body. The function of the body, therefore, is merely to protect the passengers. To eliminate noise, both when new and after long use, the body is built up in such a way that wood never comes in contact with

wood. This principle is applied even to the doors and the door frame, which are made with such a big gap between the two that they cannot possibly touch even under the worst weaving. To avoid sharp angles, it is necessary, in certain cases, to secure molding to the wooden body frame, but where this is done, canvas or leather packing is inserted between the two pieces of wood.

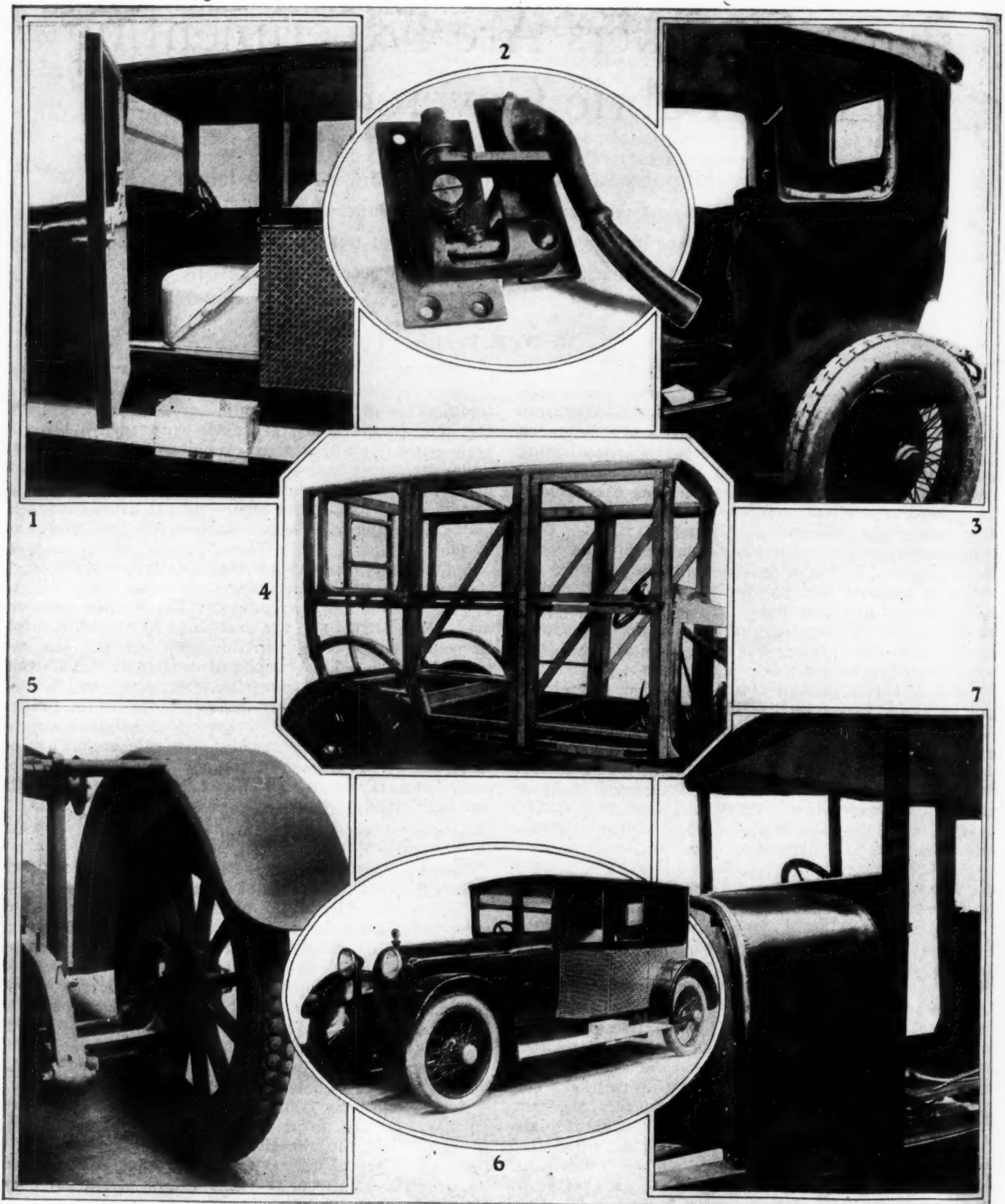
Body frame members are made, as far as possible, of the same square section, the usual size being 1½ by 1½ in. Ash is used throughout. The wooden members are drilled in jigs and are assembled by means of angle irons and bolts with a distinct gap between the two wood members. This method of construction is so contrary to the accepted coach building practice, that one of the difficulties in getting into production in the French shops has been to find workers who would assemble the bodies without hand fitting. The rule is that having been cut up accurately to size and drilled in jigs, the body frame members should go together perfectly without hand fitting.

No Longitudinal Body Sills

There are no longitudinal body sills. For a four door sedan there are four wooden cross members 1½ by 1½ in. bolted directly to the chassis frame members and extending a little distance beyond these latter. The four posts on each side are secured to the bottom cross members by means of angle irons, with a gap left between the two parts thus joined up. The frame for the roof is formed of two curved longitudinal members and four cross members. Floor boards are laid directly on the chassis frame members, and the cushions and back rests, which are entirely independent from the rest of the body, are placed on these.

A complete body frame mounted on a Talbot-Darracq chassis is shown in one of the illustrations. The body is wider than the chassis, and the doors are brought below the top of the chassis frame members, consequently they are lower than the bottom of the car floor. By putting the cushions directly on the chassis frame members, an abnormally thick cushion has to be used, which of course adds to the comfort of passengers. At the same time the total height of the body is reduced and the general lines are improved by thus dropping the door. This construction also makes it possible to get a dust-tight door which cannot rattle. Experience has shown, however, that the bottom of the door should not

Type of Construction Employed in Weymann Fabric-covered Body



1—Cushion is placed directly on the frame members. Seat back is hinged and its position controlled by straps at the side. 2—Type of door lock used. 3—Panels are covered with imitation leather tacked on a wood frame. Interior upholstery follows conventional lines. 4—Wood frame of four-door sedan mounted on chassis ready for fabric covering. By laying seat on chassis frame members and dropping door below floor level, reduction in total height is obtained without loss of head room. 5—Front fender and headlight supports. 6—Wood and fabric body. Complete weight including fenders, running boards and accessories is only 440 lbs. 7—Scuttle dash is formed of two layers of fabric with cotton wool packing between the two layers, giving the appearance of a metal pane!

be brought too near the running board, otherwise a heavy, squat appearance is obtained.

Running boards are carried on a pair of steel channel section dropped members, secured to the chassis frame members and going straight across the car. Advantage is taken of these to secure additional lateral rigidity of the body frame.

The method of mounting the front fenders is rather distinctive. Two vertical channel section supports are bolted to the frame members just above the front axle. The channel is enclosed by a flat steel plate welded on, and an eye is formed in the upper end through which is passed a steel tube carrying the fenders on its extremities. The tube is also fitted with two headlight supports with split eyes, locked by pinch bolts and thus capable of being readily adjustable at any angle.

Experience has shown that for covering the frame best results are obtained with fabric leather. This can be stretched very much tighter than is possible with natural leather, and when in position there is no tendency for it to sag. With this material, it is possible to get drum tight panels, hence no necessity for a wire or buckram foundation on which to lay the fabric has been experienced. The method of fitting it is to tack one edge; then, drawing the fabric leather tight with nippers, to tack the opposite edge. The tacked edges are afterwards covered over with molding. The interior is upholstered in practically the same manner as in normal type body construction. When sitting in the car there is nothing to indicate that the cloth is laid over a frame instead of on a full panel.

Scuttle Dash Made of Fabric Leather

For the scuttle dash two layers of fabric leather with sheets of compressed cotton wool between the two are used. This gives a drum-tight surface which cannot be detected, from a sheet metal panel except by feeling. It has the advantage of being flexible, impervious to wind and rain, and at the same time has a tendency to deaden the effect of engine vibration and noises. The splash aprons between the body and the running boards are formed of fabric leather only. Between the front fender and the frame sheet aluminum $\frac{1}{2}$ mm. thick is used in order to secure the desired shape. Fabric leather is cemented on each side of the aluminum and is made use of for attaching to the fender and to the chassis. The same construction is followed for the splash apron between the front horns of the frame.

Frameless windows are used throughout. They are mounted in thick rubber tubing split open and covered with cloth. As the doors are made with a sufficient clearance to prevent them from coming into contact with the pillars no matter to what extent the body weaves, a special type of beading has had to be evolved. Excellent results have been obtained by strip rubber of half-round section encased in fabric leather. The fabric leather is covered with cement, the strip rubber placed on it, curved face downwards, and the two pressed tightly together in a split wooden mold so as to form long strips of T section, the cross member of which is rubber and fabric leather and the stem fabric leather only. This is used all around the door frame and gives a substantially air-tight joint and at the same time one which is absolutely silent. Because of the flexible doors, a special type ball and socket lock is employed as shown in the accompanying illustration.

There is nothing special in the construction of the seats and the back rests other than the increased depth. The back is hinged to the seat and the angle of inclination determined by straps. The seats being laid directly

on the floor boards with merely a batten to prevent them sliding. They can readily be lifted out so that when the floor boards are removed, complete access to the chassis is obtained.

As fabric leather is furnished in various tints, the only painting operation required is one coat of varnish. The fenders and hood, being the only metal parts, are treated separately, either by hand painting or baking.

When in full production this type of body is expected to cost less than normal bodies, although at present the price is about equal to that of custom built bodies. The surface is said to wear better than metal panels, while minor accidents are cheaper to repair than on metal panel bodies.

Claims Buckram Unsuitable

Experiments with fabric bodies have been made in the Citroen shops during the past two years. According to M. Deloire, head of the body department, the use of wire and buckram as a foundation on which to lay the fabric has not given good results, for the wire bends slightly under vibration and permanent pleats are formed in the fabric.

Deloire is convinced of the advantage of fabric over normal methods of construction for closed bodies. On the Citroen phaeton the use of sheet aluminum panels with Zapon cemented on represents a saving in weight of about 50 pounds, cost being almost the same as with normal construction. Better results have been obtained, however, with three-ply wood panels covered with Zapon, this giving a saving of weight of between 65 and 70 pounds on a phaeton body. The Citroen engineer finds that there is comparatively little saving in cost for the cheaper cars, for the only operation eliminated by the use of Zapon is that of painting, and by the new methods now employed the 5 h. p. Citroens are given three coats in six hours, with very good results.

For higher class closed bodies, on which it is customary to give ten coats, the use of three-ply wood bodies and fabric covering gives a saving in weight and in production costs, for these bodies can be turned out without even varnishing. They are not liable to be injured by handling when in shipment, and by the use at intervals of boiled linseed oil the surface can be kept in perfect condition.

As an experiment on the part of the Citroen Body department the four cars which André Citroen took into the Sahara desert had three-ply wood bodies covered with Zapon. These cars were roughly handled, had to travel across country, and were subjected to a hot climate. If it is found that they have not suffered, this will be conclusive proof of the value of this particular type of construction.

Citroen Using Zapon Roof

For two years now the roof of all Citroen closed cars has been formed of Zapon laid on wood ribs, consisting of four heavy cross members and about six light polished wood members. The upper half of the rear panel has also been made in the same way with very good results.

While the Citroen engineers are convinced that three-ply wood and fabric has advantages over all other methods of construction for closed bodies, the commercial department has hesitated to adopt this on account of the resistance which is always felt in France against any innovation. Despite its advantages, both from the factory standpoint and that of the client, the public must be educated up to the point where it will accept this type of construction.

Research Shows How to Increase Cylinder Fin Efficiency

Straight tapered section easy to produce and is quite light. 7 deg. taper considered best. Large number of small fins are preferable to fewer large ones so long as air passages are adequate. Sheet metal type, cast in, has some advantages.

By C. B. Dicksee

Automotive Engineering Dept., Westinghouse Electric & Manufacturing Co.

THE object of adding fins to a cylinder is to keep it within a practical working temperature. For the same temperature difference at the root a thick fin has a higher mean temperature than a thinner one of the same height, but the number of fins which can be added in a given space will be reduced.

The quantity of heat flowing diminishes toward the outer end of the fin. If, therefore, the area of path is maintained constant (as in the case of a fin of rectangular section) the rate of flow will decrease and the temperature gradient will be reduced as the tip is approached. This will result in a somewhat higher mean temperature than is found in a fin which tapers to a knife edge, but

which has the same height and same thickness at the root. The weight of the tapered fin is half that of the rectangular fin so that on a heat to weight basis the tapered fin is very much more efficient.

Weight is frequently of importance, and the weight of the cooling fins adds appreciably to that of the engine, so that the efficiency of a fin on the weight basis needs to be considered.

In any mechanism a maximum economy of material is effected when

all parts are uniformly stressed. This is equally true for heat flow and the maximum economy of material will result when the rate of flow is constant. Constant rate of flow means a uniform temperature gradient which results in a fin shaped very much like an ordinary razor blade. Such a section, although ideal, is impracticable for manufacturing reasons, and is never found in practice.

A fin which is a straight taper from root to a knife edge at the tip is slightly heavier than the ideal shape, but will handle somewhat more heat.

Straight Tapered Fin

A fin having a straight taper to some finite dimension at the tip is the one almost invariably employed though a convex or concave flank is sometimes used. The straight taper is, however, more easily produced either by casting or machining. Such a fin is heavier than the full triangular shape, but is best suited for actual service. For a given height and root thickness it will handle slightly more heat which will to some extent offset the increased weight. The following table shows the relative merits of four fins of sections outlined above, each being $\frac{1}{4}$ in. thick at the root and $1\frac{1}{2}$ in. high, made of cast iron having a thermal conductivity of material in watts per sq. in. per deg. C. of 1.1, and working under conditions such that $K_v = .05$ = coefficient of velocity in watts per sq. in. per deg. C.:

Shape of Fin	Relative Weight	Per Cent	Watts lost per in. per deg. C.		Ratio	
			Per difference Watts	Per Cent	Watts to Per Weight Cent	
Section for uniform gradient	.1545	100	.105	100	.68	100
Full triangular	.1875	121	.110	105	.587	86
Truncated triangular	.2342	151	.1149	109	.49	72
Rectangular	.375	242	.125	119	.332	49

The saving in weight due to tapering the fin is clearly illustrated. This is particularly so in the case of the fin for constant temperature gradient, but as already stated manufacturing conditions prevent its use. The actual sections of each fin together with the temperature gradient are shown in Fig. 1.

The shape and proportions adopted for fins depend largely upon the material used and the method of production employed. Cast fins must have somewhat greater thickness than those machined from the solid.

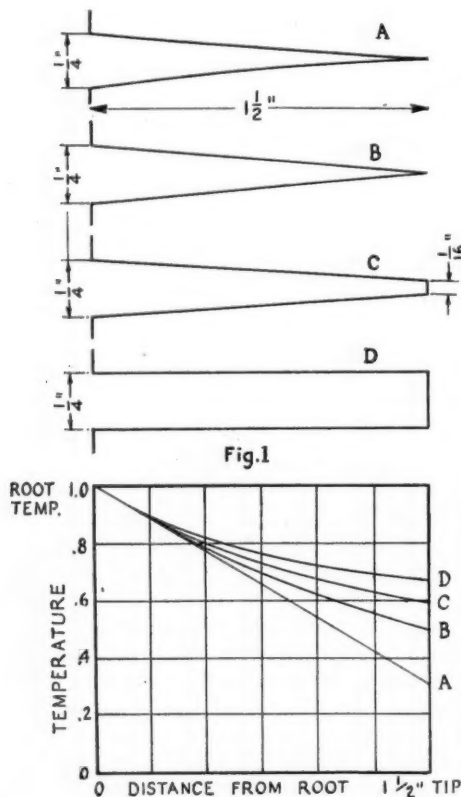


Fig. 1—Relation between section of fin and temperature gradient

The material most commonly used for cylinders of automobile engines is cast iron. Aluminum involves expensive construction and so far has not been employed for air-cooled automobile engines. To take full advantage of the higher thermal conductivity of aluminum a rather greater air velocity is necessary than can be readily produced. At low velocities the improvement is slight. With heavy wall sections, aluminum will, however, tend to level up the inevitable difference in temperature of the combustion chamber.

Cylinders machined from solid forgings are common on air-cooled airplane engines, but on account of the high cost of production are not found on engines of any other type.

With cast iron the requirements of the foundry and of mechanical strength call for a somewhat thick fin. A minimum of 1/16 in. at the tip is required for satisfactory production. A taper of 5 deg. is about as small as will be practicable, but in many instances slightly more taper is desirable. Probably 7 deg. (practically 1/8 in. per in.) is the best all-round figure. This taper in conjunction with 1/16 in. at the tip gives a fin 3/16 in. thick at the root for a 1 in. fin. This is a reasonable foundry proportion, and at the same time possesses ample mechanical strength.

When deciding fin dimensions it is well to remember that, since the surface presented varies as the first power of the dimensions and the weight varies as the second, it is preferable to employ a large number of small fins than a lesser number of large ones. However, a certain minimum passage is necessary between fins for the cooling air. If the space between fins is too small, the pressure required to force the air through is high, and, as on automobile engines the pressure available is never very great, this must be considered. With a free air stream fins which are spaced too closely offer such resistance that the air velocity between them is unduly reduced and the cooling effect diminished.

The space between adjacent fins should not be less than about 3/16 in. at the root for heights up to 1 in.; above this 1/4 in. will probably be required. This means that the space between fins will approximately equal the thickness at the root when the proportions given above are used.

Casting Sheet Steel Fins

A method of construction which has a great deal to recommend it is that employed by the builders of a well-known air-cooled car. This consists of casting sheet steel fins longitudinally into the cast iron barrel. This method of construction enables a very large number of thin fins to be used, but results in a somewhat heavier cylinder as it is necessary to increase its thickness by an amount equal to the depth to which the fins are embedded.

With careful foundry work it is possible to obtain a perfect union between the steel and cast iron as shown in Fig. 2 which is a microphotograph taken from a cylinder manufactured by the firm with which the author is connected.

The fins in this case are made from steel .05 in. thick and 1 1/4 in. wide, embedded 1/8 in. into the iron and spaced approximately 5 per in. of circumference. With these fins the height relative to the thickness is great, and it is as well to check them by calculation, as, where a good air velocity is available, it is quite possible to exceed the economical height. This not only increases weight but also increases the overall length of the engine and throws additional work on the fan. About 1/16 in. is the upper limit for thickness; somewhat less being easier for the foundry. The limit in the other direction is settled by questions of mechanical strength, spacing, and the in-

creased time taken in setting up the pattern if too many fins are used. Probably 1/32 in. is as thin as is suitable for production, while 5/32 in. between fins at the root is as close as the foundry cares to make them. This method of construction, while not so economical in the matter of weight, has a great deal to recommend it and with careful foundry work makes a first class product.

It is axiomatic that fins should be arranged parallel, or nearly so, to the air stream; but this is not by any means strictly followed when an unconfined air stream is used. Instances are seen where, because a greater number of fins can be fitted, or because foundry work is simplified, fins are placed at right angles to the direction of the air. Such an arrangement is of course practically useless.

Heat Handling Capacity

The accompanying curves, Figs. 3 to 7, give the heat handling capacity per in. of fin for tapered cast iron fins of the proportions outlined above, together with those for the sheet steel fins also described. These will be found useful when scheming the cooling arrangement of an air-cooled engine and enable the relative merits of several arrangements of fins to be readily ascertained.

Let us now turn to the theory upon which some of the foregoing conclusions are based.

The specific heat of air can be taken as 0.24, and the density as 0.076 lb. = cu. ft. at 60 deg. Fahr. and 760 mm. mercury, so that one cu. ft. of air is capable of absorbing only 0.0183 B.t.u. per deg. Fahr. against 62.5 B.t.u. per deg. Fahr. in the case of water. In addition to this, the thermal conductivity of air is so low that very little heat is conducted from a layer of air adjacent to the hot body to those more remote. Only a relatively thin layer is therefore effective for cooling. This defect is somewhat offset by the fact that, except at exceedingly low velocities, air never flows over a surface in a smooth stream, but, due to the friction between the surface and the air, is subjected to a considerable degree of turbulence which increases the depth of the effective layer to some extent. Even so, the depth is still very limited.

These conditions necessitate a relatively high air velocity as well as some means of increasing the surface presented to the air; and, furthermore, the air stream should be split up into a number of thin sections if a satisfactory rate of heat exchange is to be obtained. To accomplish this the outer surface of the cylinder is covered with vanes or fins, while in some instances spikes have been employed.

It has become a more or less common practice to speak of a cylinder as having so much cooling surface per b. hp. This is very misleading as the heat distribution over the cylinder is far from uniform and the mean temperature of the fin surface is largely dependent upon their proportions.

The flow of heat is governed by two simple laws similar to those which govern the flow of other fluids, and by the application of these, problems dealing with heat flow can be investigated.

The heat exchange between the surface of any body and an air stream flowing over it may be expressed by the equation:

$$W = T \times A \times K_v \dots \dots \dots (1)$$

where W = heat exchange in watts

T = temperature difference between air and body in deg. C.

A = area of surface exposed in sq. in.

K_v = coefficient of velocity in watts per sq. in. per deg. C.

The watt is taken as the unit of energy as being of convenient size for the purpose.

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Let Fig. 8 represent a fin of triangular cross section, projecting from a hot body into an air stream. The function of such a fin is, first, to present a surface from which the air can remove heat; second, to provide a path along which heat can flow to the surface. When equilibrium is reached it is obvious that the heat carried away from the surface must equal the heat flowing down the fin.

In accordance with the second law of thermodynamics heat flows from a higher to a lower temperature, hence it follows that the temperature at the tip of the fin must be lower than that at the root. If the rate of heat extraction is increased due to an increase in air velocity, the rate of flow along the fin must also increase and a greater difference in temperature between root and tip will result. The converse also holds true, and provided the reactions are maintained for a sufficient length of time equilibrium will finally be reached.

The relationship between temperature drop* and heat flow is given by the following equation:

$$t = \frac{WD}{K_t A} \dots \dots (2)$$

Where t = temperature difference between two points on fin in deg. C.

W = quantity of heat flowing in watts

*To avoid confusion "difference" will be used to denote the difference in temperature between air and the fin, while "drop" will be used to denote differences between two points on the fin.

D = distance between two points in in.

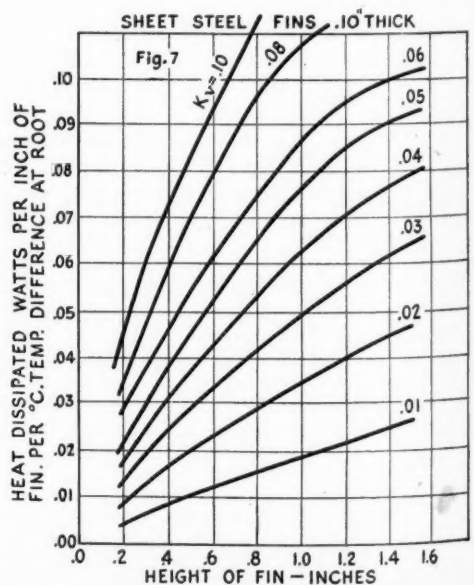
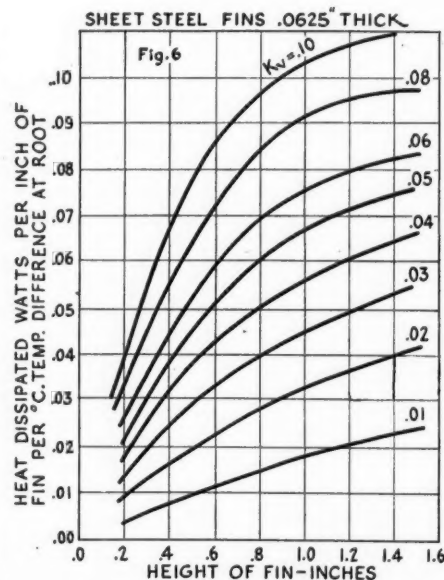
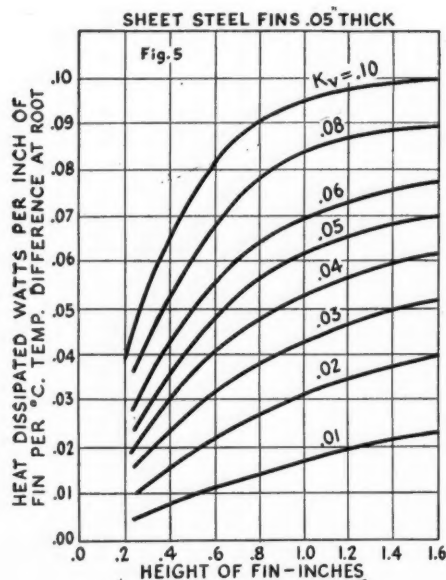
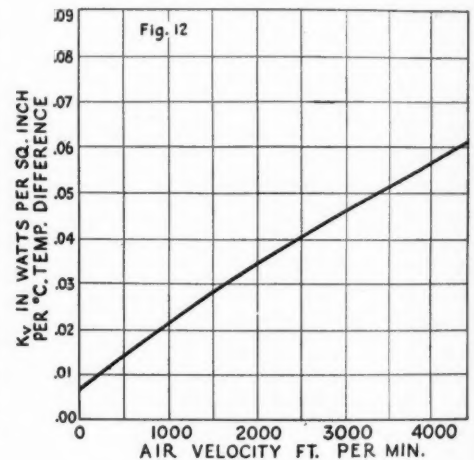
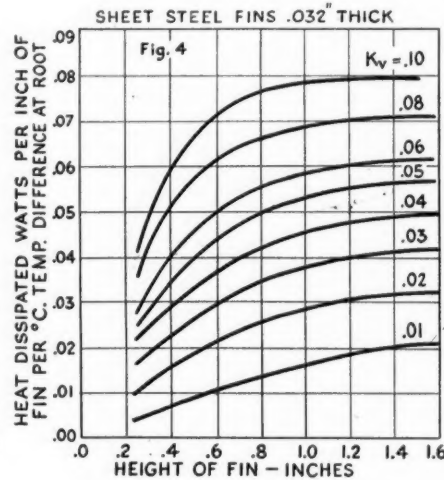
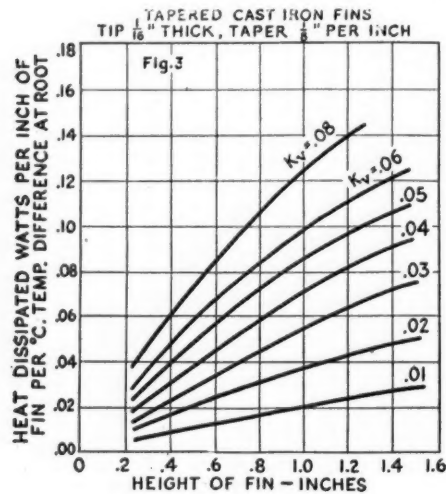
K_t = thermal conductivity of material in watts per sq. in. per in. per deg. C.

A = cross sectional area of heat path in sq. in.

In Fig. 1, since air is flowing over all parts of the surface from root to tip, heat will be surrendered from every portion which has a temperature greater than that of the air stream. With fins of the proportions suitable for combustion engines, this will certainly be the case. Heat will therefore be surrendered from all parts of the surface. Since any engine is required to run for far greater periods of time than is necessary for equilibrium to be reached, only this condition need be considered. Under the above conditions the quantity of heat flowing along a fin, such as is shown in Fig. 1, will gradually diminish from a maximum at the root to zero at the tip. If any point $a-a$ be selected on the fin the heat passing that point must equal the heat dissipated from the surface between $a-a$ and the tip.

With a fin terminating in some finite dimension as shown in Fig. 9, the flow of heat at the tip will not fall to zero, but will have some small value due to the heat surrendered from the surface thus provided.

An examination of the factors comprising equation 2, will show that three out of the five are physical dimensions which are under the direct control of the designer. From this it is clear that t and W are directly related, that is,



Figs. 3 to 7—Curves showing the heat handling capacity per in. of fin for tapered cast iron and sheet steel fins of various proportions. Fig. 12—Relation between coefficient of velocity and air velocity

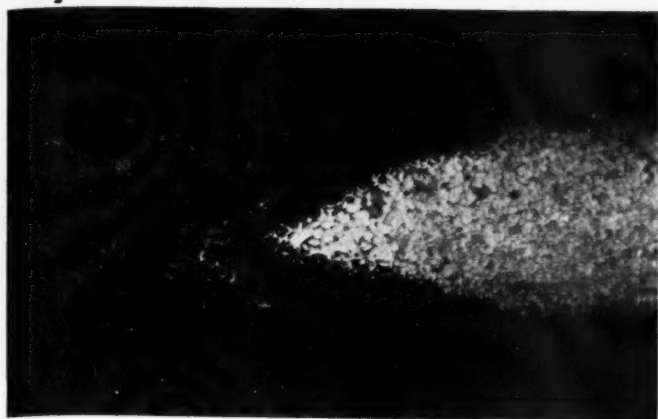
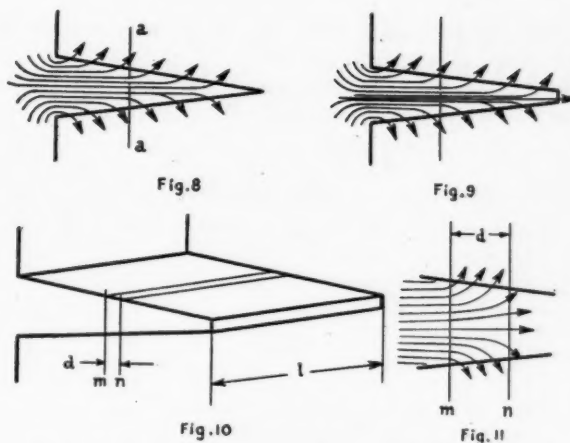


Fig. 2—Microphotograph showing bond between steel fin and cast iron cylinder



Figs. 8 to 11—Diagrams showing flow of heat in fins of different section

the temperature gradient is a measure of the heat flowing.

It is now necessary to look into the actual conditions somewhat more closely. Fig. 10 represents a unit length l taken in a fin of indefinite length. Let m and n be two points upon the surface dividing off a narrow strip d inches in width. This strip is shown enlarged in Fig. 2a. A certain quantity of heat is flowing into strip at m , and to maintain equilibrium, the same quantity must pass out. This happens in two ways. One part flows out through n into the remainder of the fin, and the other is lost from the exposed surfaces to the air flowing over them.

Let the heat flowing out through $n = W$, and the heat flowing out through exposed surfaces $= w$. The heat flowing into the strip will then be $W + w$. Since heat is flowing there must be a drop in temperature between m and n . Let T_m be the temperature above air at m , and T_n that at n . The drop in temperature between m and n may then be written:

$$T_m - T_n = t$$

According to equation 2, t is proportional to the quantity of heat flowing. This, however, is a varying amount, the quantity at m being greater than that at n ; but, if m and n be taken sufficiently close together the temperature may be assumed to fall uniformly from T_m to T_n . The mean temperature difference between the strip and the air will then be

$$\frac{T_m + T_n}{2} = T_n + \frac{t}{2}$$

Under these conditions w (the heat lost from the exposed surface of the strip) may be said to be lost at a uniform rate proportional to the mean temperature difference. Since, however, the whole of w does not travel from m to n the equivalent heat flow in the strip will be

$$W + w/2$$

It will be well to state here that these arguments are based upon the assumption that the flow is unidirectional, which is not strictly true. Actually there will be a flow of heat from the interior toward the outer surface. Also should there be (as is commonly the case) any variation in temperature between different points along the base of the fin, there will be flow in a longitudinal direction as well. Surface presented by the end of a fin will also have a certain effect. In reality, therefore, the flow is tridirectional, but the error produced is negligible if unidirectional flow is assumed for fins of proportions suitable for combustion engines.

When analyzing fins it is of advantage to take a length of 1 in. Under these conditions the area in sq. in. exposed by a strip equals twice the width of the strip in in.; while the area of path becomes equal (numerically)

to the thickness of the fin. The value of b for a strip from a tapered fin may be taken as the mean thickness; i. e., if b_m = the thickness at m (Figs. 10 and 11) and b_n = thickness at n , then

$$b = \frac{b_n + b_m}{2}$$

For a 1 in. length of fin equation 1 will then become

$$w = (T_n + t/2 \times 2d) K_v \dots \dots \dots (3)$$

and equation 2 becomes

$$t = \frac{(W + w/2)d}{K_t \times b} \dots \dots \dots (4)$$

As they stand these two equations do not supply sufficient information for solution, since to know t , $(W + w/2)$ must be known; while to find w , t must be known.

If, however, a strip be taken at the extreme tip, it will be found that the transmitted heat (W) becomes zero and that the only heat flowing is that dissipated by the strip itself. The value for this strip can then be obtained by equation 3 if the temperature difference at the tip is known. In the case of a fin which terminates in some definite dimension the surface presented by the tip must be taken into account. To do this the area may be added to that of the faces of the strip, or a greater degree of accuracy will be obtained by treating the surface separately and finding the heat dissipated from it. This can then be taken as transmitted heat (W) for the first strip.

As a rule, the temperature difference at the tip is unknown, but that at the root is either known or must be kept below a certain figure. Since the heat lost is a function of the temperature drop between root and tip, any convenient temperature difference at the tip may be assumed. The fin can then be checked over and the result finally expressed as heat lost per degree difference at the root.

To arrive at the heat handling capacity of a fin it is necessary to utilize the method outlined above. This is by no means as tedious as it sounds as it will be found that strips $1/4$ in. wide will produce results sufficiently accurate for all practical purposes.

The following example will make the procedure quite plain: It is required to know the heat handling capacity per in. of a fin having a height of 1 in. and tapering from $1/16$ in. thick at the tip to $3/16$ in. at the root. The material is cast iron having a thermal conductivity (K_t) of 1.1 and the condition of the surface and the air velocity are such that the coefficient of velocity (K_v) is .05 watts per sq. in. per deg. C. temperature difference.

Assume that the temperature difference at the tip is 100 deg. C. As stated above, strips $1/4$ in. wide being

taken, the area of path (b) for each strip will be .078, .11, .14, and .172 sq. in.

Treating the tip area separately, the heat lost from the surface will be given by equation 3 and will be

$$w = 100 \times .0625 \times .05 = .3125 \text{ watts}$$

Strip 1.

(a) The watts lost from surface by equation 3 will be

$$wl = (T + t_1/2) 2d \times K_v = (100 + t_1/2) 2 \times .25 \times .05 = 2.3 \times .0125 t_1$$

and (b) temperature drop (t_1) from equation 4 =

$$t_1 = \frac{\left(W + \frac{w_1}{2}\right) d}{K_t \times b} = \left(.3125 + \frac{2.5 + .0125 t_1}{2}\right) \frac{.25}{1.1 \times .078} = (1.5625 + .00625 t_1) 2.89$$

$$= 4.52 + .018 t_1 = 4.52/.982 = 4.6 \text{ deg. C.}$$

Substituting in (a) for t_1 we get

$$w_1 = 2.5 + .0125 \times 4.6 = 2.557 \text{ watts}$$

Total heat handled = 2.577 + .3125 = 2.87 watts

Temperature difference at beginning of strip = 100 + 4.6 = 104.6 deg. C.

Strip 2.

$$(a) w_2 = \left(104.5 + \frac{t_2}{2}\right) 2 \times .25 \times .05 = 2.62 + .0125 t_2$$

$$(b) t_2 = \left(2.87 + \frac{2.62 + .0125 t_2}{2}\right) \frac{.25}{1.1 \times .11} = (4.18 + .00625 t_2) 2.06$$

$$= 8.64 + .013 t_2 = 8.64/.987 = 8.75 \text{ deg. C.}$$

and substituting as before

$$w_2 = 2.62 + .0125 \times 8.75 = 2.73 \text{ watts}$$

Total heat = 2.73 + 2.87 = 5.60 watts

Temperature difference at beginning of strip = 104.6 + 8.75 = 113.35 deg. C.

Strip 3.

$$(a) w_3 = \left(113.35 + \frac{t_3}{2}\right) .025 = 2.84 + .0125 t_3$$

$$(b) t_3 = \left(5.60 + \frac{2.84 + .0125 t_3}{2}\right) \frac{.25}{1.1 \times .14} = (7.02 + .00625 t_3) \frac{.25}{1.1 \times .14}$$

$$= 11.38 + .0101 t_3 = 11.38/.989 = 11.5 \text{ deg. C.}$$

hence $w_3 = 2.84 + .0125 \times 11.5 = 2.984$ watts

Total heat = 2.984 + 5.60 = 8.584 watts

Temperature difference at beginning of strip = 113.35 + 11.5 = 124.85 deg. C.

Strip 4.

$$(a) w_4 = \left(124.85 + \frac{t_4}{2}\right) .025 = 3.11 + .0125 t_4$$

$$(b) t_4 = \left(8.584 + \frac{3.11 + .0125 t_4}{2}\right) \frac{.25}{1.1 \times .172} = (10.134 + .00625 t_4) \frac{.25}{1.1 \times .172}$$

$$= (10.134 + .00625 t_4) \frac{.25}{1.1 \times .172}$$

$$= 13.4 + .00826 t_4 = 13.4/.992 = 13.52 \text{ deg. C.}$$

hence $w_4 = 3.11 + .0125 \times 13.52 = 3.28$

Total heat = 3.28 + 8.58 = 11.86 watts.

Temperature difference at root 124.85 + 13.52 = 138.37 deg. C.

Therefore, heat lost per degree difference at root 11.86/138.27 = .086 watts per in. of fin.

Values will now be required for K_t and K_v . As already stated, K_t , the thermal conductivity of the material from which the fin is made, is measured in watts per in. per

sq. in. per deg. C. temperature drop. That is, the quantity of heat which will pass through a path 1 sq. in. in area, 1 in. long with a temperature drop of 1 deg. C. in the inch. The following table gives the values for the materials of which cylinder fins are likely to be made.

Material	Thermal Conductivity (K_t) watts per sq. in. per in. per deg. C.
Copper rolled (hard or soft).....	9.00
" cast.....	8.70
Aluminum hard.....	4.90
" soft.....	5.00
Cast iron (grey).....	1.10
Malleable iron.....	0.80
Ingot iron.....	0.95
Hot rolled steel.....	1.10

The value of the coefficient of velocity (K_v) is not so definite. The value increases with an increase in velocity but not quite as a straight line. Fig. 12 gives values of K_v for velocities up to 5000 ft. per min. according to some recent experiments which place the value for sheet metal surfaces at $K_v = .0145 V^{.5}$ where K_v = the coefficient of velocity in watts per sq. in. per deg. C. temperature difference.

V = velocity of air in thousands of ft. per min.

A good cast surface will have a value about 15 per cent higher than the above figure. In actual practice the air is split up into a number of small streams each passing through a duct formed by the cylinder wall and the faces of the adjacent fins. Under these conditions it is found that the ratio of perimeter to area of a duct has an effect upon the value of K_v . From experiments it would appear that the ratio of perimeter to area giving the highest value of K_v is about 5:1 when perimeter is measured in in. and area in sq. in. A reduction to the extent of about 15 per cent is sustained when R is reduced to 1:1. The same loss will be found for an increase to 10:1. The expression for K_v given above is based upon the ratio of 5:1.

The material forming the cylinder walls or fins has no bearing upon the rate of heat transfer from the surface to the air but the color apparently has some slight bearing. This would appear to be on a question of radiation, which while slight, at temperature suitable for engine cylinders, will be somewhat greater for a black surface such as is presented by a cast iron fin than for the surface presented by a machined steel or aluminum fin. The difference, however, will be slight for conditions under which an engine cylinder is called upon to operate. Dr. Gibson found that it was possible to increase K_v for aluminum by about 10 per cent by special enamel.* It is clear then that the value of K_v cannot be stated in figures as definite as can that of K_t , but when allowance has been made for the nature of the surface and the perimeter to area ratio the value obtained from the expression quoted will give results which are accurate enough for all practical purposes.

THE construction and operation of a self-contained electrically propelled train is being carried on experimentally in the Johannesburg district of South Africa. Power is generated from the "char" or ash from locomotive boilers which at the present time is being thrown on the waste heap.

The wagon is a heavy main-line type weighing about 30 tons. It carries its own gas-generating plant and internal combustion engine driving a dynamo, which in turn furnishes current for the electric motors providing the actual tractive power. On the experimental run a speed of about 20 m.p.h. was attained.

*Vol. XIV Proceedings Institution of Automobile Engineers. London.

Individual Engine Assembly Method Gets Greater Accuracy

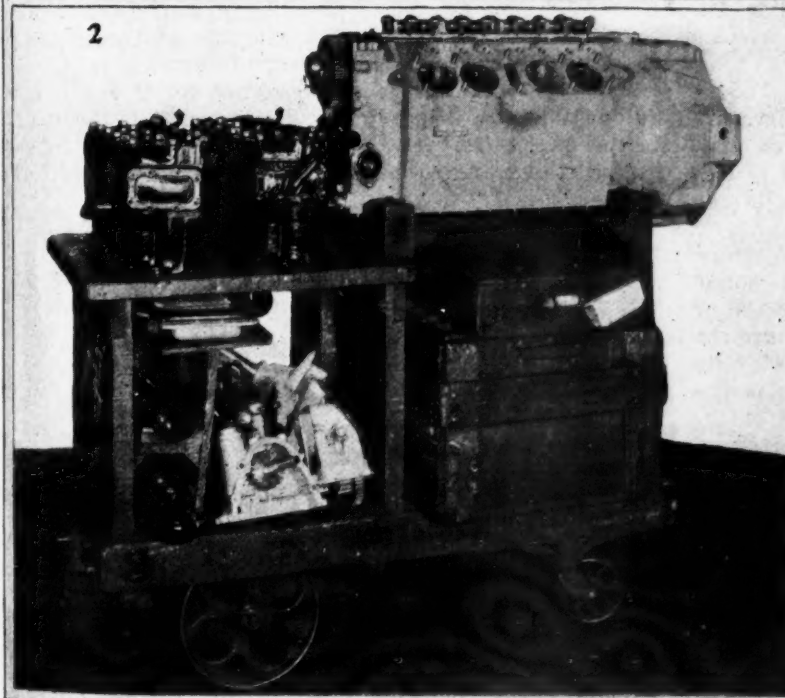
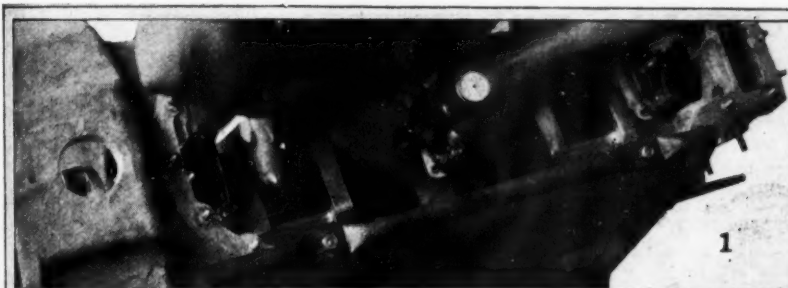
One man builds up entire Cadillac powerplant from carefully inspected sub-assemblies. Responsibility for all work fixed. Cost slightly higher than with true progressive system. Considered worth while because of better parts inter-relation.

By J. Edward Schipper

BY using individual instead of progressive methods the Cadillac Motor Car Co. is securing excellent results in its engine assembly department. With this arrangement one man builds up an engine and hence becomes responsible for it. The fundamental principle of securing accuracy by fixing responsibility is well known to manufacturers. In this engine assembly department the principle is applied to advantage and it has been made a matter of pride with the men to be certain that the engines they turn

out do not come back with troubles that indicate faulty assembly.

The cost of assembly per engine by this method is probably from 20 to 30 per cent higher than by a true progressive system where one man performs one operation repeatedly. The system was adopted in spite of this, as it is believed that a better product results. With one assembler the inter-relationship between the various engine parts is more closely studied than when a man pays atten-



1—Checking the bearings for a crankshaft that has been assembled into a crankcase with the bearings before it is passed along to the final assembly. 2—Truck with all the parts and sub-assemblies necessary to assemble a complete Cadillac engine ready for the final assembly. 3—Final assembler at work on stand putting together a Cadillac engine. He assembles the entire unit and is responsible for it

tion to a single part without regard to other operations or units with which he is not immediately concerned.

Before the engine reaches the final assembler, all of the work which has to be done by specialists on sub-assemblies is completed. The crankshaft, for example, has been assembled with the main bearings in the crankcase. This requires the work of an experienced man specializing on main bearings. In the Cadillac engine after the bearings are reamed they are hand scraped to a fit. A 95 per cent bearing surface is secured by these scrapers, and it would, of course, be absurd to have the whole engine assembled by men who would qualify as bearing scrapers.

Very rigid inspections are maintained on the sub-assemblies before they are passed over to the final assembly department. The clearances on the main bearings for instance are held within .001 in. tolerance. Incidentally, the method of inspecting this clearance is unique and interesting.

The hole in the main bearing cap to which the oil pressure line is attached is utilized as an inspection hole, and an amplifying gage fitted on a special plug for passing through this hole is employed as a check. The plug with the spindle for the gage is inserted and the crankshaft is rotated by hand. The total variation in clearance is not permitted to exceed .001 in. in any position of the crankshaft, or with any bearing.

After the various sub-assemblies and parts have been

given a 100 per cent inspection, they are loaded on special trucks designed to take a complete set of the necessary units to build an engine. The trucks are placed in position available for the final assemblers. As soon as a man completes the assembly of an engine he secures one of these trucks, pushes it over to his assembly rack and starts to work. All of the parts necessary for him to assemble the engine completely are where he can reach them readily. The trucks are always loaded in exactly the same manner so that there is no time lost in searching for the parts. As soon as the assembler finishes his work he turns in the empty truck and picks up a loaded one.

Each assembler can put together three engines per day. When the assembler gets his truck with the parts on it, the first operation is to stamp the serial number with a die. A record is made at the same time of the man who is going to do the assembly work.

After the engines leave the stand they receive a thorough test on the dynamometer and a complete running in process before they are dropped into the chassis. The chassis also receives a road test for final checking purposes. Any inaccuracies or faulty assembly work that is detected in these tests or after the car is in the hands of the owner out on the road, can be checked by the complete system of records to the man who built the engine. These returns are few and far between—the sense of responsibility and the pride of workmanship engendered by this system prevent them.

Die Sinking Tool Designed for Pressed Steel Parts

IN the manufacture of dies for the production of pressed metal parts, it is frequently necessary to form the surface of the die to some unusual curve. When the surface is spherical or has the form of a paraboloid, or some other solid of revolution, the problem is a comparatively simple one since it involves moving either the tool or the work through an arc of the desired shape, while the face is being machined. The tool can be given a rotating motion in case of the spherical surface or can be caused to follow the contour of a cam when some other form of surface is required.

If it is desired to form some surface which is not a true surface of revolution, but which has a curvature which is continually changing in relation to a fixed axis, the problem becomes much more complicated and is difficult, if not practically impossible, of performance on any ordinary standard tool.

In the accompanying photograph is shown a machine which was developed for making dies for an automobile headlamp reflector whose reflecting surface is composed of a series of adjacent parabolic curves, all of which have the same focus and formula, but each having an axis of its own instead of the axes being common to all, as is the case with the ordinary parabolic reflector. It will be observed that an ordinary machine lathe was converted by the use of special attachments to accomplish the desired purpose. The attachments or groups of units are two in number, each of which consists of several parts. One unit serves to hold the die block and to give it a certain movement during the forming of the surface that results when the die block is presented to the cutting tool in different positions.

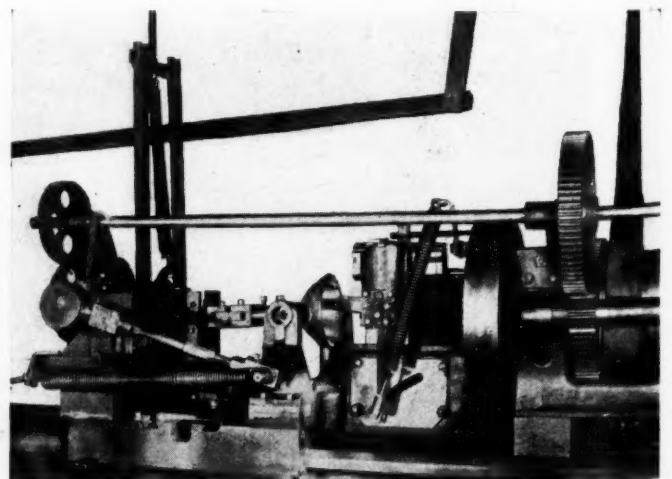
The second, or revolving unit, consists of a cutting tool mounted on a sort of secondary lathe which is fastened to the face plate of the primary lathe and revolves therewith. The concave piece which is to be machined is mounted in trunnions on a special pedestal, designed to fit the cross slide of the lathe carriage. The mechanism

seen at the left of the photograph is so arranged as to rock the die block being machined about the axis of the trunnion which, in this case, passes through the focal point of the paraboloidal surface to be machined.

The mechanism attached to the face plate is so designed as to give the cutting tool the motion required to produce the surface desired.

By the use of this machine, which was produced by the Lester-Johnson Co., it is possible to produce accurately formed die blocks for the manufacture of the peculiarly shaped reflector which this concern is developing.

Although the machine was designed for this particular automotive part, it is believed that the principles employed in the mechanism here briefly described, will in time be utilized to advantage in accurately machining other forms of die blocks.



Machine specially designed by Lester-Johnson Co. for finishing dies used in the manufacture of pressed metal headlamp reflectors.

Rail Car with Six-Cylinder Engine Used Successfully Nine Years

Drive is by bevel gears and chains to both axles of forward truck. Vertical shaft with central universal of internal-external gear type connects bevel gears on bolster to gearset above. Full speed range available either forward or reverse.

By Lawrence H. Kirk

SERVICEABILITY is an established fact in the case of at least one rail car which has been in practically constant use by short line roads for nearly nine years. The car in question is not built upon a truck chassis modified for the particular class of service involved, but is an eighteen-ton car designed especially for railway work. Nevertheless it incorporates numerous characteristic automotive features, including a six-cylinder engine, dry multiple disk clutch, combination bevel gear and chain drive, anti-friction bearings, and the like.

The gearset is of particular interest, since it combines a three-speed sliding gear with a vertical drive shaft which has a bevel pinion at its lower end. This pinion meshes with either of two bevel gears enabling full speed in either direction. The squared shaft which carries the crown gears drives by chains to each axle of the leading truck.

While this car is heavier than cars of the type built around modified truck or bus chassis, it is not of the very heavy type which has sometimes been demanded by railroad men whose experience has been confined largely to

conventional steam railway equipment. It can be said to represent a sort of compromise between purely automotive and largely railway types, and may therefore prove more satisfactory to some railway men who are inclined to criticize rail cars which are only trucks equipped with flanged wheels and a few other features essential to railway applications.

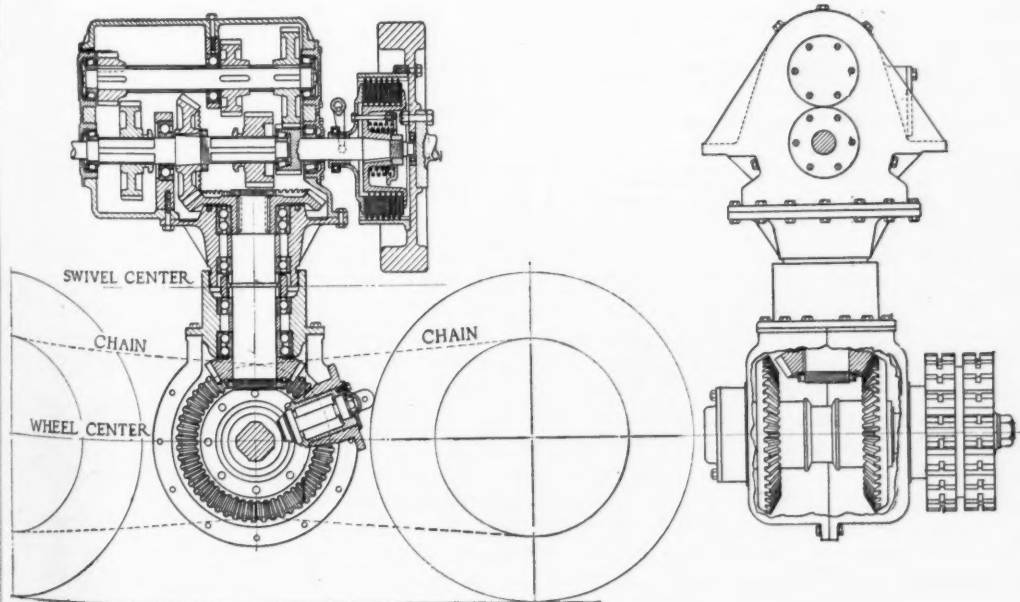
The car in question was built in 1914 and is still in service, making regular runs of 75 miles per day with very little repair expense, proving that the fundamental principles in the design are sound and practical.

Owing to the fact that the road on which the car is used has heavy grades and poor road bed, and a schedule which required frequent stops, it was necessary to design a car of medium weight with sufficient power to make the grades easily and allow quick starting and easy stopping.

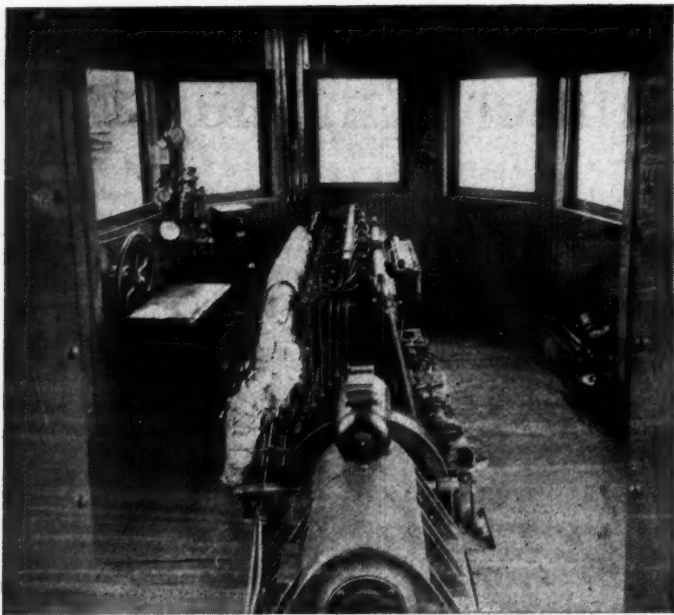
The power plant consists of a 6-cylinder 90 hp. Buffalo engine of 6 $\frac{1}{4}$ in. bore, 6 $\frac{3}{4}$ in. stroke, developing its maximum power at 900 r.p.m. Starting is by air, electric or by hand ratchet.

The clutch is a dry multiple disk type, having ample surface to enable starting so gradual that it cannot be felt in the car. The clutch is built on the main shaft of the upper gearset, the front end running in a ball bearing in the flywheel. The outer or driving drum is bolted to the inside of flywheel.

The upper gearset is of the three-speed selective type with countershaft running above the main shaft. The unique feature of the construction lies in the final drive of this transmission. On the main shaft, between low and second gears, is placed a bevel gear, which meshes with a larger bevel lying in the bottom of the case. The shaft of this lower bevel terminates in a pinion gear cut on the shaft. This gear runs inside the recess of



Vertical sectional views of the three-speed gearset and clutch. Note universal joint in vertical shaft. Double bevel below permits of using all speeds in either direction. The vertical shaft in the center of the forward truck swivels about the ball joint



Powerplant of the rail car which is described in the text. Drive from gearset seen in the foreground is by vertical shaft, bevel gears and chains to both axles of forward truck

one part of a ball socket joint. The bottom face of this gear is on the center line between the bolster plates, which are large enough in diameter to allow of sufficient clearance on the extension housing.

The lower gearset is carried on two trunnion brackets which are bolted to the truck bolster. The units in the lower case consist of two bevel gears on a main shaft, which lies parallel with the car axles. These gears are driven by a bevel pinion, the shaft of which ends in a gear similar to the gear of the lower end of the upper vertical shaft, but is in the opposite pit of the ball socket joint. When the two cases are in position, the two pinion gears lie about $\frac{1}{4}$ in. apart, and are connected by a ring gear with internal teeth. The ball socket joint of the two housings allows the gearset cases to swivel while the trunnion brackets take up the irregularities of the truck movements out of a parallel plane.

The axis of the vertical drive shaft is exactly in the center of the leading truck, and this truck swivels about this axis. With this type construction a rail car can be used even on trolley roads where the curves are of very short radius, providing the brake rods are arranged to clear.

The only objection which has been raised to this construction is that there is, due to the torque reaction, some tendency to twist the truck on the track, but it is claimed that tests made with the rails greased, the rear truck blocked to prevent forward motion of the car, and the wheels forced toward one side showed that even with the gears in low speed position dropping in the clutch caused no motion of the truck.

The two large bevels are shifted along the square shaft by means of an eccentric roller bearing which acts also as a thrust bearing. This sliding of the bevel gears allows of the same speed forward and reverse.

The end of the shaft of the lower gearset projects outside of the case, and is fitted with a double face Morse Chain Co. sprocket. This sprocket is counterbored, so as to set well back over the bearings and close to one bracket.

The final drive is through Morse chains, one driving the forward axle and one to the after axle of the forward truck. This gives a flexible drive, and at the same time

the gear ratio is easily changed.

The forward end of the car is the engine room and baggage compartment. This is separated from the passenger compartment, by two steel bulkheads 28 in. apart, access between being through a narrow companionway closed by a door in the center of the car. On each side of this companionway between the bulkheads are carried two 50 gal. gasoline tanks, set on end. This affords easy filling and also gravity feed to the engine.

Outside of the gasoline tanks are two 25 gal. reserve water tanks, through which all water for cooling is pumped. The water is cooled by passing through two honeycombed radiators under the center of the car and a tubular radiator on the roof.

The car body is a semi-steel type, with wood coverings. It is built on 6-8 in. channels with T-iron side members tied with steel bands which pass completely around the car.

The main passenger compartment or center section has accommodation for 38 passengers. Access is by center entrance, a drop girder being used to allow steps for surface stops. This arrangement enables one man to handle baggage and passengers quickly.

The after end of the car is the smoking compartment, seating six passengers. This end is rounded so as to give very comfortable seating, and allow it to be used for observation.

The heating of the car is by coils through which the hot water from the engine jacket passes. An electric lighting system, using 24-volt storage batteries, is employed.

The brake system is the Westinghouse automatic type. The compressor is carried under the car, and is driven by silent chain from a shaft which is an extension of the main shaft of the upper gearbox. This enables the car to run the compressor while coasting, even though the engine is shut off; if it is necessary to pump while the car is standing the lower gearset is placed in neutral and the upper in direct. The lighting dynamo is also driven from the same shaft, as the car is running a great deal with the engine shut off.

The car bearings were made by the Railway Roller Bearing Company and are very satisfactory; one man can push this 18-ton car on the level.

On a test of seven days, running 84 miles per day, 20 gal. of gasoline, $1\frac{1}{2}$ gal. of cylinder oil, and an average of 3 lb. of grease per day was used. This made the running cost of the car $3\frac{3}{4}$ cents per mile.

Successful Operation on Grades

The grades of the road on which this car was first used varied from $3\frac{1}{4}$ to 1 per cent, there being very little level track on the road. There were fifteen stops, and the 20 miles could be made easily in 1 hour and 10 minutes.

Bevel gears for final drive could be used instead of silent chains, if desired, by changing the position of the lower gearset so that the square shaft would be at right angles to the truck axles instead of parallel thereto, and then connecting the shaft ends by universal joints to bevel gearing in suitable housings.

This car was designed and some of the units built by the author. It was intended to take care of short branch line business. It was deemed necessary to follow as closely as possible railway usage and construction.

The car was first used by the L. O. & S. Railroad for about four years. When this road was sold the car was purchased by Grasse River Road in St. Lawrence County, New York, where it has since been used. The manager of this road is understood to be well pleased with the car, and especially with the chain drive, although the author prefers a bevel gear hook up with the lower case.

Japan Needs 10,000 Motor Trucks To Aid Railroads

Prominent Japanese transportation expert shows how gasoline vehicles can supplement existing rail facilities. Government may buy buses and make highway improvements instead of going through with railway development plan at present contemplated.

"JAPAN should buy 10,000 motor trucks for service in aid of her insufficient State railway services," declares Yoshio Kinoshita, a prominent railway man, in an article contributed to the Tokyo Asahi, one of the leading dailies in Tokyo. According to Kinoshita, if the Japanese Government has to build her proposed new lines of State railway continuously in the future, her railway budget will become a menace to the general finances of the Japanese Government. Automobile and truck service can be substituted economically and efficiently for some of the proposed new lines. Kinoshita's opinion is shared by the Japanese railway authorities, and the Department of Railways is now preparing a bill, based on the same idea, to be introduced into the Imperial Diet. The bill is being delayed because the Home Department, which controls road construction, is to be consulted about the construction of better roads necessary for automobile service. This is essential in Japan since the roads are poor. The scope of the Railway Department's plan is not known as yet, but it can be said authoritatively that their plan is based on Kinoshita's suggestion. Until two years ago, Kinoshita served in the Imperial Department of Railways, holding important posts in succession, his last being that of Director of Tokyo Railway Controlling Bureau. Following is a digest of his opinions on the transportation situation in Japan:

The Government has two railway construction schemes, already approved by the Imperial Diet, one proposing about 2700 miles of new lines, to be built in ten years, beginning with the year 1920, and the other for the construction of 6300 miles more, approved by the Diet last year. The Government is thus proposing, with already the approval of the National Legislature, to build 9000 miles of new lines, and none of them is a trunk line. They are all branch lines to one trunk line or another. They have to run through the districts where passenger traffic is scarce and where there is little merchandise to be transported. Construction cost will be about 320,000 yen per mile.

The construction of 9000 miles, therefore, will cost the government about 3,000,000 yen. Supposing that these 9000 miles should be built in 20 years, as the railway authorities desire, the Government has to appropriate 100,000,000 yen—150,000,000 yen a year for the construction of new lines. In addition, the Government has to continue repairing or improving the existing State railways, which costs 130,000,000 yen a year at present. This will have to be increased to 200,000,000 yen a year in the near future, and even to 300,000,000 yen a year a little later. Thus, the Government has not only to improve present

railway accommodations, which are of an old type, but has to increase their transportation capacity, too.

If the government really means to improve its present railways sufficiently on one hand, and on the other to build its proposed new lines, it has to raise for these purposes a fund of 150,000,000 yen a year, which will have to be increased to 200,000,000 a year in the few years to come, in addition to the annual profit from the State railways, all of which, too, has to be spent for these purposes. It is quite doubtful whether our financial market is prepared to invest such a big amount each year in railways alone.

Even suppose that the market is prepared to take up the loans, it is doubtful if the Department of Railways will be able to manage the payment of interest due on these loans. In case the government really carries out its proposed two schemes of railway construction, the railway budget will indeed menace the general finances of the Government.

Automobile and truck transportation has many advantages over railway transportation in the districts where passengers and merchandise to be transported are comparatively little, and when the distance of transportation is not very long. This is the case with most of the proposed railway lines of the Japanese Government. The recent development of automobile and truck services in England and in the United States as means for the transportation of both passengers and merchandise show clearly their economic possibilities. Automobile services should be used in Japan in lieu of some of these proposed railway lines.

In adopting trucks for road transportation there are many problems to consider. In the first place, new roads have to be built or present ones improved. In most districts where the government is proposing to build new lines, some kinds of roads exist. In these districts existing roads can be improved, so as to make them suitable for truck transportation.

Import Duty Will Be Lowered

As there is no automobile industry in Japan, the necessary trucks will have to be imported from foreign countries. At present such trucks pay a high import duty so that the cost of an imported truck in Japan is rather high. This price can be brought down by reducing import duty on those trucks that the government will purchase for the above purpose, as they are to be put in the popular services of the people at large.

The present high rates of local taxes on automobiles and trucks have to be and can be remedied.

The price of gasoline, too, has to be considered. Some years ago the price of gasoline was 1.60 yen, or 1.70 yen

per gallon. Now it is 1.00 yen, or even less, per gallon, though it is true that the price is still high compared with prices prevailing in the United States and other countries. Japan is producing herself only one-half or one-third of the light oil which it consumes. The rest of the demand is supplied from Borneo, the United States, and some other countries. Considering ocean freight, import duty, packing, etc., the present price of 1.00 yen per gallon is still a little too high, compared with the price of 30 cents per gallon prevailing in the Pacific Coast States in America.

Repair shops, the training of drivers and such problems, can be settled without difficulty. Drivers can be trained and railway men are already being trained. They can be employed at lower wages than in the western countries, though it is true that their wages are comparatively high at present, as they are limited in number.

I suggest, therefore, that motor trucks be adopted in lieu of some of the proposed new railway lines. Considering the condition of the roads, I suggest the use of a 2-ton 20-passenger bus as standard. And according to present market prices such a truck and a bus can be bought at a price of between 10,000 yen and 12,000 yen.

As it is, with 300,000,000 yen, or one-tenth of the total cost of the construction of the proposed 9000 miles of new lines, the Government can improve these 9000 miles of roads, purchase about 10,000 buses and trucks, install all necessary equipment for the service, build the necessary repair shops, and establish a school for the training of drivers.

All these things can be completed in a few years, while the construction of the proposed lines would require a number of years.

German Government Revises Motor Vehicle Taxes

EARLY last spring the German government revised its motor vehicle taxation schedule because of the heavy depreciation of the Mark. Further depreciation has forced the government to make additional revisions. The new schedule recently put into effect follows:

(1) Motor Cycles

Rated Power	Tax for One Year in Marks	Tax for Six Month, in Marks
Up to 1.5 hp.....	2000	1334
More than 1.5 to 3 hp..	3000	2000
More than 3 to 3.5 hp..	4000	2667
More than 3.5 to 4 hp..	5500	3667
More than 4 hp.....	7000	4667

(2) Passenger Cars (Exclusive of Motor Buses)

Rated Power	Tax for One Year in Marks	Tax for Six Month, in Marks
From 1 to 6 hp., for each hp.	2000	1334
More than 6 to 10 hp., for each hp.....	4000	2668
More than 10 to 14 hp., for each hp.	6000	4000
More than 14 hp., for each hp.	8000	5334

In accordance with this table a car of 6 hp. would pay a tax of 12,000 Marks, a car of 10 hp. a tax of 28,000 Marks, a car of 14 hp. a tax of 52,000 Marks, and a car of 40 hp. a tax of 260,000 Marks for one year.

(3) Gasoline Trucks and Buses

Weight of Empty Vehicle, in Kg.	Tax in Marks		
	For One Year	For Six Months	For Two Months
Up to 500	6000	4000	2000
More than 500 to 1000.....	12000	8000	4000
More than 1000 to 1500.....	18000	12000	6000
More than 1500 to 2000.....	24000	16000	8000
More than 2000 to 2500.....	28000	18667	9334
More than 2500 to 3000.....	32000	21334	10667
More than 3000 to 3500.....	36000	24000	12000
More than 3500 to 4000.....	38000	25334	12667
More than 4000	40000	26667	13340

All weights based on empty truck ready for service.

(4) Electric or Steam Trucks and Gasoline Tractors

Weight of empty vehicle, ready for service, is the basis for tax.

Weight of Empty Vehicle, in Kg.	Tax in Marks		
	For One Year	For Six Months	For Two Months
Up to 500	3000	2000	1000
More than 500 to 1000.....	6000	4000	2000
More than 1000 to 1500.....	9000	6000	3000
More than 1500 to 2000.....	12000	8000	4000
More than 2000 to 2500.....	14000	9334	4667
More than 2500 to 3000.....	16000	10667	5334
More than 3000 to 3500.....	18000	12000	6000
More than 3500 to 4000.....	19000	12667	6334
More than 4000	20000	1334	6667

(5) Taxes for Test Runs

	Tax in Marks		
	For One Year	For Six Months	For Two Months
Motor vehicles of all kinds...	40000	26667	10000
Motor cycles only	6000	4000	1500

Other taxes have not been changed.

ALL invoices accompanying shipments of automobile casings and inner tubes going into Spain must show the serial numbers of both the tires and the tubes in order to be admitted, according to a royal order published in Madrid and cabled to the Department of Commerce.

A period of 45 days has been granted so that foreign exporters may accommodate their shipments, to this order, but American shippers are urged to see to it that all tires and tubes intended for the Spanish market bear a serial number before shipped, as it is the intention of the Spanish Government to enforce this requirement strictly.

AUTOMOBILE passenger service is being furnished between the cities of Kalgan and Urga, China, a distance of 700 miles, according to a United States Consular report from Shanghai. Twenty-five touring cars are used on the route, all of American make. The report on their performance reads as follows:

"When it is considered that these ordinary five-passenger touring cars are often called on to carry a ton or a ton and a half of passengers and baggage, their performance is truly remarkable. There are no constructed roads, the road between Kalgan and Urga is an old caravan route, and there are abominable stretches of sand, rock, gravel and dirt. Nevertheless the cars make the run in about four days."



The FORUM



Well-Designed Pistons Prevent Oil Pumping Troubles

Quantity of oil sprayed on lower part of cylinder wall need not be limited and has useful effect in cooling piston, the view of Rolls-Royce engineer.

Editor, AUTOMOTIVE INDUSTRIES:

With reference to your editorial on pressure lubrication of engines, published in AUTOMOTIVE INDUSTRIES of Aug. 3, 1922, I wish to suggest that the facts on pressure lubrication were not presented as clearly as might be.

To begin with, pressure lubrication is no new thing, but has been used by many of the makers of high class automobiles both here and abroad for at least fifteen years past.

The race track, and, more particularly, the thousands of road races and "reliability trials" of Europe have proved conclusively that under arduous conditions of service nothing else will do. The war confirmed this verdict.

Secondly, modern automobile engine design does not limit the amount of oil delivered to the underside of the piston. The baffles which used to be put in for this purpose have disappeared. It is realized that a copious spray of oil below the pistons has a useful effect in cooling the pistons, and engines are being designed in Europe which depend almost entirely on this action for their cooling. Properly designed pistons, whether of aluminum or cast iron, do not pass this oil up into the combustion chamber, or burn it on their under sides.

Variations in the quantity of this spray therefore should not affect the oil consumption of a reasonably designed engine. If it did, then the variation between the condition of cold oil in winter time, with little spray below the pistons, and hot oil in summer time with much spray, would lead either to seizure in the one case or over-oiling in the other.

It is a matter of common experience with pressure-fed engines that this does not occur, although in some designs the increased flow of oil from the ends of the main bearings and big ends, when the oil is hot, is so great

that the oil pressure drops 20 or 30 per cent with hot oil.

Thirdly, if it be conceded that a variation of 400 or 500 per cent in the amount of oil delivered to the underside of the pistons in a properly designed engine, does not appreciably influence the condition of lubrication of the bore, as I think is proved by the best practice, then the argument for pressure lubrication rather than splash is overwhelming.

SEVERAL months ago the subject of "oil pumping," or the difficulty which results from excessive amounts of oil reaching the combustion chamber of an engine, was widely discussed in papers presented before the Society of Automotive Engineers and its Sections, as well as in the editorial columns of AUTOMOTIVE INDUSTRIES. A number of commentators took the position that one effective means of preventing the trouble is to limit the quantity of oil which reaches the cylinder walls, especially in the case of pressure feed lubricating systems operating at high speeds or with bearings which are so worn as to provide too much clearance.

M. Olley, engineer of Rolls-Royce of America, Inc., takes a somewhat different position in the matter, as will be seen by the accompanying communication which is worthy of careful study by all who are interested in this important subject.

As your editorial states, a splash lubricated big end, at any given speed, will pick up just so much oil. But if the bearing is slightly worn, say, to twice its initial clearance, this quantity of oil may not be sufficient to maintain the film, especially considering that it is flung from the bearing much more quickly by centrifugal force, because of the increased clearance, and that the film is broken down more readily because of the increased difference between the external and internal radii of the bearing. Hence a splash-fed big end will knock far more readily than one fed by an oil pump, which is maintained "full" of oil, no matter what clearance exists between the pin and the bearing metal.

It is an actual fact that a pressure-fed big end

bearing, which at the end of twelve or fifteen years' constant use may show a clearance of five-thousandths, whereas it started with a clearance of one-thousandth, will not knock under any conditions of running except a deliberately advanced spark coupled with full throttle and dead slow speed, and will then only produce the slightest knock which can scarcely be heard in the driver's seat.

Fourthly, it is a matter of common experience in engines with adequate pressure lubrication systems, that the wear of main bearings and big ends is very slow.

In airplane engines in which the working life between overhauls was from 150 hours upward, it was rarely necessary to take up bearings during overhaul.

The efficacy of pressure feeding is proved by the fact that the white metal of the bearing shells almost always shows a dull "matt" surface, even where several thousandths of wear has occurred, showing that there has scarcely ever been metallic contact between the bearing-metal and the shaft. It appears that the wear in such cases is actually caused by the oil, or by slight impurities in the oil, and that the film has never been absent from between the bearing surfaces.

Fifthly, the scraper ring is an absolutely effective means of preventing oil pumping, when properly designed, and current European and American practice proves it so.

It will remain effective practically forever, given five conditions—good piston rings which will maintain their sealing effect by equal pressure on the bore even when worn, well designed ring grooves which will not hammer loose, a sufficient number of rings, cylinder castings which have a close, hard texture, and at all times a copious supply of oil.

An increase of the piston ring gap at the joint from, say, 10 thousandths to 50 thousandths, has practically no effect in the amount of oil which passes the piston, given properly bedding rings.

Given good initial design and first class workmanship, the appearance of oil in the combustion chamber will decrease continuously up to at least fifty thousand miles of running, even though the quantity of oil spray below the pistons may increase. This is due to the better bedding between the rings and pistons and the cylinder walls which occurs when such surfaces, carefully prepared in the first place, are run together for a long time with proper lubrication.

Sixthly, your editorial states that the aim should be a constant rate of circulation for a given engine speed. This appears to be the general aim, but is neither theoretically nor practically correct. The aim should be to maintain the oil film under all conditions of running. In an aero or marine engine in which the load is a function of the speed, an oil pressure which varies with the speed may be able to give perfect lubrication under all conditions. In some automobiles, notably those with relatively small, high speed engines of the European type, in which the power falls off rapidly at low engine speeds, a varying oil pressure may give perfect results.

But in automobiles which are designed to use high gear almost entirely and in which therefore the engine must have good low speed power, an oil pressure which varies with the speed will not give perfect lubrication under all conditions. Particularly a varying oil pressure will not supply sufficient oil when the engine is laboring up a grade on high gear, with the throttle wide open and the engine speed down about 500 r. p. m.

Varying Oil Pressures Often Inadequate

There is no difficulty in finding the most trying conditions of service for an automobile engine. The engine itself announces its distress audibly under the above conditions, and neither a splash system nor an oil pressure system in which excessive drop of pressure at low speeds is allowed, treat the engine fairly under such conditions.

An unvarying oil pressure such as is obtained from an oil pump of ample size is the first step toward avoiding this trouble. The delivery of oil at low speeds must be sufficient to take care of full throttle loads, unless some supplementary supply at full throttle is arranged, and the delivery will therefore be more than necessary to take care of idling. But, as stated above, with good piston design this excess of oil does not cause any trouble.

At higher speeds, more oil will be thrown from the

cranks because of the effect of centrifugal force in emptying the bearings, and this will probably be sufficient to take care of all high speed conditions. It may be necessary to supply extra oil to the cylinder walls, however, when the throttle is fully opened.

Such a system has been strongly urged for trucks, but it does not appear to be widely known that the Rolls-Royce car for fifteen years has had a complete pressure system of this type, with constant pressure at all speeds, and a supplementary oil feed direct to each cylinder wall to take care of all full-throttle conditions, independent of the speed.

M. OLLEY, Engineer,
Rolls-Royce of America, Inc.

Shearing of Oil Film Creates Pressure Which Results in "Pumping"

Editor, AUTOMOTIVE INDUSTRIES:

Had Arthur La Fontaine been present at the September Metropolitan Section Meeting I am quite certain he would not have written the letter which appeared in AUTOMOTIVE INDUSTRIES October 12, 1922. His letter is a magnificent example of the easy way in which the subject of oil pumping can be partially thought out and all the essentials just missed.

First, as to the effect of pressure in the combustion chamber. The pressure difference which causes oil to pass from below the piston ring through any free space to a point above the piston ring is not the difference between crankcase pressure and cylinder pressure. It is the difference between the oil film pressure immediately below the ring and the cylinder pressure immediately above it. As the piston descends the ring is scraping oil ahead of it and so shearing the film. This creates an oil film pressure of at least a hundred pounds per square inch, and very likely more. If, therefore, we have atmospheric pressure in the cylinder, we have a pressure difference tending to transfer oil past the ring of eighty-five pounds, taking the atmosphere as fifteen pounds. If, on the other hand, the vacuum in the cylinder is considerable, we merely add the difference between fifteen pounds and the existing vacuum. Suppose the cylinder pressure is five pounds instead of fifteen, then the pressure difference tending to transfer oil would be ninety-five pounds instead of eighty-five. The flow of oil through small spaces is not in proportion to the pressure, but increases less rapidly than the pressure. Consequently, the difference in flow produced by a ten per cent increase in pressure would be negligible. Finally, this is not a matter of "assumption," but of perfectly definite, clear and simple lubrication experiments.

Secondly, as to the combustion in the cylinder. The temperature during the expansion stroke is at its greatest at full throttle and at its lowest with closed throttle. The amount of oil pumped per minute is solely a function of the number of revolutions. Whether oil burns with smoke or without smoke depends upon the intensity of heat in the combustion chamber, and upon nothing else. Consequently, at low throttle there is usually insufficient heat to completely burn any oil, whereas at full throttle there is usually enough heat to completely burn the great majority of automobile engine oils.

Of course, the amount of oil pumped is affected by the amount thrown into the cylinder. I believe the easiest way to picture the action is as follows: Regard the ring as a piston and the ring groove as a cylinder, then the side clearance will be the stroke and the ring and groove will make one stroke with each stroke of the engine. This makes each ring the equivalent of a piston pump running

at engine speed, but with, of course, extremely small capacity. The imaginary pump is fed with oil under pressure, this pressure being the film existing due to the scraping of the ring. Now this film pressure will increase as the thickness of the oil film between the piston skirt and the cylinder wall increases. The ring has to drive before it very nearly all the oil that is on the cylinder wall. The ring itself actually rides upon a film of minute thickness. If when the piston is at top stroke there is a thin and even film of lubricant on the cylinder walls, then the ring in descending will build up let us say one hundred pounds pressure. If on the other hand the cylinder be flooded with oil, then the work to be done by the ring in removing it will be greater, the pressure built up will be greater, and the quantity pumped greater. Again thinking of the ring and ring groove as a piston pump, one may also consider variation in thickness of the cylinder film as equivalent to throttling the intake to the pump.

A. LUDLOW CLAYDEN,
Chief Engineer, Gas Engine Research,
Sun Company.

Cylinder Wall Temperatures Far Above That of Cooling Water

Editor, AUTOMOTIVE INDUSTRIES:

S. W. Rushmore's rash assurances regarding the cooling conditions in the single cylinder Liberty tests quoted from my communication which was printed in AUTOMOTIVE INDUSTRIES of Nov. 30, 1922, are not in accordance with the facts. A window was provided in the jacket, thus conditions in the high temperature zone could be observed by means of an electric light installed inside the jacket. Water was in direct contact (except for intervening scale) with the cylinder walls, in all tests, and even when violent boiling occurred no visible steam layer separated the walls from the water. Steam was not generated in a sheet, but in the form of small bubbles, which were immediately carried away by the water current.

From the success of the sub-aqueous oxy-acetylene cutting torch it would appear that a marked temperature disparity can obtain between a metal plate and water in contact with it.

Guldner, in Design and Calculations of Gas Engines (German edition), records tests on a Korting gas engine showing a combustion chamber wall temperature of 100 deg. Fahr. above that of the outgoing water, this in a zone having a large and free jacket space. A recent paper on "High Speed Oil Engines," by J. L. Chaloner¹ indicates that the temperature of directly water-cooled cylinder walls in large oil engines is commonly in excess of 400 deg. Fahr.

While the engineers who carried out the Liberty cylinder tests may not have been familiar with the boiler tests quoted by Mr. Rushmore, they had thoroughly studied the work of H. Kreisinger and J. F. Barkley on "Heat Conduction Through Boiler Tubes"² and used similar methods of temperature measurement.

Rushmore apparently ignores the fact that water is rarely in direct contact with the cylinder walls of a water-cooled engine, owing to scale, and that the latter is an excellent heat insulator.

Clayden exaggerates the difficulty of producing an efficient air-cooled engine, although it is admitted that, except in aircraft engines, the process is by no means as certain as it is for a water-cooled type. I disagree with the statement that the aircraft engine is an entirely dif-

ferent subject from the car engine. Cheap, but highly efficient air-cooled cylinder constructions suitable for car engines are only barred for aircraft use by weight.

It is the aircraft engine with outputs of over 40 hp. per cylinder that has resulted in air-cooling paralleling the best efforts of water-cooled engine designers as regards output, fuel economy and thermal reliability.

There is some doubt as to whether cylinder temperature is the limiting factor in preventing further increase of output in aircraft engines. The Engineering Division of the Air Service has recently carried out work bearing on this subject. Tests were conducted on a 4½ in. bore by 5½ in. stroke cast-iron head air-cooled cylinder; this developed 155 lb. per sq. in. i.m.e.p. at 1800 r.p.m. with a 5.3 to 1 compression ratio, and using 80 per cent aviation gasoline and 20 per cent benzol, the maximum combustion chamber wall temperature being over 700 deg. Fahr. All cooling fins were later removed and a water jacket fitted. When tested in this form, with all other conditions as before, no increase of output was obtained, although in this case the cylinder wall temperature did not exceed 200 deg. Fahr.

While the aircraft engine uses high quality fuel, it has to operate continuously at high mean effective pressure. Cooling difficulties rapidly increase with increasing mean effective pressure, thus in a car engine the low mean effective pressure and low load factor more than counterbalance the advantage of the fuel used by the aircraft engine.

For this country and Canada, and other countries with such extremes of climate, air-cooled engines would seem most desirable for the utility car. In the northern States and Canada the maintenance of the cooling system of the average water-cooled car in winter, what with boiling, freezing and replacement of alcohol, requires a considerable amount of time and expense. If air-cooling is the most desirable system, why proceed to it via vapor cooling with its attendant disadvantages of fragile radiator, risk of freezing, and troubles with scale deposits?

Temperature control in an air-cooled car engine is really only a minor difficulty, readily overcome by shuttering with either manual operation or automatic thermostatic control by the temperature of the cooling air after it has passed over the engine.

S. D. HERRON,
Engineering Division, Air Service, U. S. A.

Glucose as Anti-Freeze Mixture

OWING to the publicity which has been given to the use of glucose and water in the cooling systems of automobiles, the Bureau of Standards has conducted a few experiments to determine the behavior of such solutions in cold weather.

A cold temperature bath of salt water was stirred and used to cool test tubes and smaller glass tubes, having thin and thick walls, partially filled with glucose solutions of several strengths. In no case did any glucose solution burst the container in freezing, but pure water burst some of the smaller thin wall tubes. A sample core of radiator of the ribbon type, 8 inch square with headers, was filled with 20 per cent. glucose solution and left outdoors during a cold night. It froze solid, but no rupture occurred.

It, therefore, appears that glucose will prevent a radiator from bursting, but it should be remembered that it will lower the freezing point of the cooling medium but very little, and such a solution would, therefore, tend to clog up the cooling system at low temperatures.

¹See The Forum, AUTOMOTIVE INDUSTRIES, Feb. 15, 1923.

²Institution of Automobile Engineers, Feb. 1923.

³Technical Paper 114, Bureau of Mines.

Parts Distribution Methods Fail to Meet Business Needs

System has not kept pace with rapid growth in use of motor vehicles. Increasing cost of marketing reduces possibilities of profit. Quicker turnover obtained through limitation of brands carried. Careful consideration of field essential.

By Harry Tipper

WITH a registration of over 12,000,000 motor vehicles, the business of supplying the parts and accessories, supplies, etc., necessary for the continued running of this number is a business of immense size and considerable complexity. The problem of distribution and the problem of costs in connection with this distribution are becoming more important and more difficult.

The problem is complicated by the fact that the use of motor vehicles has risen so rapidly that the distributing system has never been adjusted to the particular condition or to the particular range of products. It takes years for a system of distribution to develop so that there is a proper amount of stability in its operation, and a careful examination of the condition and costs in connection with its work.

It is not surprising, therefore, that there are grave problems to be worked out in connection with the distribution of automotive products. What is really surprising is the extent to which the distribution of these products has been successfully accomplished in the very short time during which the work has been done, and in the face of its rapid development.

The conditions which the manufacturers of replacement commodities are facing in the endeavor to secure maximum sales effect, can be generally stated as follows:

1. The costs of operating real estate establishments are rising and, as a consequence, the retailer finds himself with too little profit for the volume of business done. Very frequently he finds that he has made no profit at all from his operations.
2. The wholesale costs have been rising in a similar way and, as a consequence, the wholesaler finds himself with a business which yields him an insufficient amount of profit for the volume, and is consequently in an unstable condition.
3. There are too many dealers coming into, and going out of, the field for proper stability. Mortality is

not excessive in consideration of the age of the industry, but it adds considerably to the cost of maintaining wide distribution.

4. The manufacturer is not satisfied with the sales effort of the jobber, while the jobber, in turn, is not satisfied with the possibilities of profit.

5. There is a tendency seen for the costs of distribution to increase.

6. There is a strong tendency on the part of retailers and jobbers to limit the number of brands of any item carried, in order to improve the total turnover and increase the profit possibilities of the business.

7. On the part of the manufacturers there is a tendency to a more careful selection of the right elements in distribution rather than widespread distribution of all kinds.

Variations in Volume of Retailers' Business

These problems are sufficiently important to demand the fullest attention of the manufacturer and a careful understanding of the position of the wholesale and retail elements in the distribution system in order that he may work out his marketing program with less difficulty and with a more careful consideration of the possibilities of profit all along the line.

Sometime ago, in talking about the retailer in these columns, reference was made to the difference in the volume of business carried by various percentages of retailers in the automotive field. It was pointed out at that time that approximately 80 per cent of the business was carried by 20 per cent of the retailers; approximately 15 per cent of the business by 20 per cent of the retailers, and approximately 5 per cent of the business by 60 per cent of the retailers.

Some figures which have been secured lately, indicate that about 25 per cent of the jobbers for these manufacturers do about 65-70 per cent of the business, and that about 60 per cent of the jobbers do about 6 per cent of the business. The proportions vary somewhat from these averages, but, in general, they indicate the variation in buying power and business possibility in the jobbing and retailing fields.

With many manufacturers attempting to get 100 per cent distribution in both jobbing and retailing fields, the cost of competitive effort on the part of the manufacturer results in a large amount of business being carried at a loss and paid for by the rest of the business carried.

“IT is obviously a part of the manufacturer's problem when the retailer finds it difficult to make a profit, or the wholesaler finds his volume does not increase his value. The system of distribution cannot remain stable and become more efficient unless the possibilities of profit are there.”

Dealers' stocks have been diversified so that they are now carrying thousands of items where they were carrying a few hundred several years ago—all of which are added to the cost of doing business. This, of course, has led the manufacturer to the more intensive consideration of the right kind of distribution just as it has led the jobber to the more intensive consideration of his turnover.

Some manufacturers of replacement parts have cut their number of jobbers in two, especially in certain territories. A good many jobbers have cut down the number of brands of a similar article carried, so that where they used to carry twelve brands they are now carrying six or seven; where they used to carry six or seven they are now carrying three or four, without suffering any loss in the volume.

Tendency to Limit Brands

Of course, this tendency does not apply to the automotive field alone. The same tendency is exhibited in all lines of wholesaling and retailing. In the examination of a small chain of drug stores, a marketing man discovered that they were carrying thirty-two brands of toilet goods, of which seventeen brands were doing over 95 per cent of the business.

These conditions, however, suggest the development of certain changes in the manufacturer's operations to meet the new necessities. These changes might be generally classified as follows:

(a) More intensive territorial analysis from the standpoint of

Productivity,
Competition and
Distributing necessities.

(b) More careful consideration of the retail field with the idea of selecting the retail outlets rather than accepting a general distribution through all retailers. This is particularly important in connection with the manufacturer's missionary and sales promotion efforts which should not be expended in securing more or less useless distributions.

(c) A careful consideration of the jobbing outlets and territorial possibilities of profit through the different jobbing considerations. Manifestly, if a hundred manufacturers of a given article are marketing their product through jobbers and dealers, and the average number of brands carried by the jobbers is six, the processes of marketing for most of those manufacturers becomes one of selective analysis rather than extensive cultivation only.

The same thing is true in connection with the retailer, and this means a concentration of all the sales promotion and selling efforts on the more valuable possibilities with the elimination of the less valuable promotion work or its curtailment to the proper amount.

Retail Profit Is Manufacturer's Problem

It is obviously a part of the manufacturer's problem when the retailer finds it difficult to make a profit, or the wholesaler finds his volume does not increase his value. The system of distribution cannot remain stable and become more efficient unless the possibilities of profit are there. Profit cannot be secured continually unless there is more careful analysis of stock and turnover on the part of the retailer, more careful consideration of the number of items carried, the possibilities of sale, and the turnover by the jobber, and, consequently, a much more definite analysis of the functions and possibilities of the distributing field by the manufacturer.

It is likely that the tendency to limit the number of brands carried will receive further impetus in the distributing of replacement parts and accessories and other items required for the continued operation of the motor

"THE average manufacturer must direct his attention more largely at the type of policy to be secured, the support of the right type of policy, the limitation of jobbing outfits to the point where a profit can be made on the article and the selection of means of promotion which will direct his efforts with as little waste as possible to these particular elements in the distributing system."

vehicle. The fundamental importance of turnover in the accumulation of profit from the distribution of goods is too important a matter to be neglected, and a study of turnover means an elimination of the more or less unnecessary items as a natural consequence.

The average manufacturer, therefore, must direct his attention more largely at the type of policy to be secured, the support of the right type of policy, the limitation of jobbing outfits to the point where a profit can be made on the article, and the selection of means of promotion which will direct his efforts with as little waste as possible to these particular elements in the distributing system.

It is obvious that the jobber cannot afford to carry products in stock in order to serve the 4 or 5 per cent volume for many customers who can buy only occasionally, and that he must select his stock so that it is at the minimum volume for his stable requirements and profitable business.

Selective Analysis Only Solution

It is equally obvious that the number of items carried by the retailer cannot be extended indefinitely, and that some curtailment is becoming necessary in the number of brands and the surplus. Meanwhile the volume of product required is increasing so that the manufacturer's possible market is growing larger. Selective analysis is one of the important methods by which the answer to the problem can be secured, provided the selective analysis is followed by selective methods of promotion which will direct the manufacturer's pressure with the least possible waste at the points of attack.

TABLES showing the rates of countervailing duties on gear crowns, bevel, pinion, valve cups and valve springs, imposed by Italy has been issued by Mackenzie Moss, Assistant Secretary of the Treasury.

The countervailing duty assessed on these items of cast iron even with accessories of other metal, weighing more than 1000 kilos, is 25 lire per 100 kilos; more than 100 and up to 1000 kilos, 27.5 lire; more than 40 and up to 100 kilos, 30 lire; more than 10 and up to 40 kilos, 32.5 lire; more than 1 and up to 10 kilos, 37.5 lire. Of other common metals weighing more than 1000 kilos the rate is 55 lire, net; more than 100 and up to 1000 kilos, 65 lire; more than 40 and up to 100 kilos, 80 lire; more than 10 and up to 40 kilos, 100 lire, and more than 1 and up to 10 kilos, 125 lire.

These basic rates of import duty for Italy are stated in gold.

PROSPECTS for sale of motor vehicles in Venezuela are brighter, according to a report to the Commerce Department from Vice-Consul S. J. Fletcher, La Guaira, on account of the improvement in exchange conditions following the first arrivals on the market of cacao and coffee crops.

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THE AUTOMOBILE

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Reduce Unit Costs

TWO automotive executives met the other day to talk over certain affairs of the industry in which they are both interested. One of them has had a broad experience in production work, while the other is the head of an important automotive enterprise. The latter is about to put into operation several new manufacturing units. Discussing these plans, he remarked:

"I think I'll build this car down in one of the cities just below the Mason-Dixon line. I have looked into the situation there and find that wage rates are quite low, so that I ought to be able to cut down my costs considerably."

"Don't fool yourself," the production man replied. "I have had personal experience in building cars in the area you mention. It is true that wage rates are lower than in the Northern cities, but you get just about as much work from the men as you pay for.

Wage rates are of little importance in any case. The only thing that matters is unit cost. It is the difference between unit manufacturing cost and selling price that determines your profit. Wage rates do not vary directly with unit costs in any sense. Sometimes they are in inverse ratio. Wages are only one factor in unit cost, and you always have to consider them as regards their relative importance if you are going to get the most economical production system."

"I hadn't thought of it in just that way before," reflected the other executive. "That certainly is the logical way to figure it out, though, isn't it? Guess I'll have to readjust my calculations a bit."

In substance this is a true story. It happened not very long ago. Current wage discussions indicate that the importance of unit costs as opposed to wage rates alone is not thoroughly recognized throughout the industry. Better understanding of this relation will minimize labor trouble and increase production efficiency.

More Transportation Needed

FRANK admission that neither the railroads nor the express companies have been able to handle satisfactorily the less than car load freight offered them was made by R. E. M. Cowie, vice-president of the American Railway Express Company, in a recent address before the Chamber of Commerce at Providence, R. I.

"The railroads have been making a splendid effort to keep traffic moving in the face of impaired conditions of locomotive power and rolling stock," Cowie said. "But the congestion of freight due to shortage of cars, to say nothing of other factors, was unavoidable and made it necessary for the railroads to place many embargoes on ordinary traffic and on l. c. l. freight.

"The inevitable result of this situation has been to drive a large volume of traffic to express that would ordinarily move by freight if the freight channels were not clogged. This shortage of facilities has also been reflected in the car equipment available for the express companies and has naturally retarded the service to an extent, in view of the fact that in time of extreme shortage only box cars have been available for this business. This has naturally hampered the movement of trains, throwing them off schedule, demoralized transportation generally and caused more or less delay to the swiftest branch of rail transportation in normal times—express."

This is merely another evidence that under normal conditions, with industry moving at full speed, the rail carriers are unable to handle expeditiously the business offered them either as freight or express. It demonstrates the need for motor equipment for the handling of this l. c. l. business where the hauls are not too long. If short haul business of this character were transferred to trucks, the rail equipment which would be relieved probably would make possible the expeditious handling of long haul shipments.

The committees appointed by the Chamber of Commerce of the United States to work out a national

transportation policy now are at work and if their work is well done, as it undoubtedly will be, they will devise some practical plan for coordinating rail and highway transport for the movement of short haul l. c. l. freight and express. Not only farmers but business and industry generally have been getting more and more out of patience with the inadequate transportation facilities supplied them and the time has come for concrete action if radical programs for government ownership are to be received sympathetically. One of the most concrete steps in this direction would be for the railroads to stop fighting the more extended use of motor vehicles and make practical use of them to supplement their own inadequate service.

Don't Spoil a Good Thing

F RONT wheel brakes have certain marked advantages which bid to be realized on American cars in the near future, but there is no denying the fact that serious results may attend their use if the installation employed is not carefully designed and well constructed.

Possible future installations should and, we believe, are being given a thorough tryout and their weak points eliminated, so far as this can be done, by careful design and construction. The danger lies in the possibility that some will not give adequate study to the front wheel brake before adopting it. Makers who follow the lead of some who have carefully investigated this type of construction, but do so without going through an adequate development period in which to perfect the particular type of construction employed, are apt to regret their haste at leisure.

It must not be forgotten that wheels which are locked against turning are unsteerable and also give less braking effect than wheels which are rolling. Partly on this account and partly for other reasons the use of front wheel brakes may result in serious skidding or other accidents, especially if the driver is not familiar with the correct method of using the brake controls.

It is admittedly desirable to so design a brake system, and especially a front wheel brake system, that the wheels cannot be locked, except when the car is standing, but to accomplish this requires either a very careful adjustment or some type of automatic regulation which involves more or less complication and in some cases a lack of positive action which, within certain limits, is highly desirable.

Bound to Curb Overloading

G OVERNOR PINCHOT'S highway conference gave added emphasis, if it were needed, to the fact that more rigid enforcement is at hand of regulations governing the weight and speed of trucks. Highway engineers from a score of States agreed that overspeeding and overloading are responsible for needless injury to highways. They sympathize, how-

ever, with the contention of the motor vehicle operator that it is an imposition to expect thorough familiarity with the widely differing regulations which are encountered in inter-state traffic. Highway transport has assumed large proportions and it is no more than fair that restrictions should be uniform, at least in States in the same general section, such as New England or the Atlantic seaboard.

The warning given by Chief MacDonald of the Bureau of Public Roads that unless uniform State regulations are enacted the Federal Government would step in and take a hand in the control of inter-state traffic, should spur legislatures and highway departments to greater effort in this direction. The highway officials agreed that it would not be difficult to secure uniformity of regulations if a decision could be reached concerning what constitutes proper weights and speeds. It would seem that with the knowledge available, solution of this problem should be comparatively simple and it is one with which automobile interests should concern themselves seriously.

Another point stressed at the conference was a determination to curb the reckless motorist who is responsible for most of the highway fatalities. There was no disposition to condemn motorists in general and it was recognized that the vast majority of them strive to obey the law both in letter and spirit.

Another point brought out at the conference, which is of special interest to the automobile industry and to motorists, is that highway departments are practically unanimous in the belief that a gasoline tax is the most equitable levy for the use of the roads. Under such a tax, it is contended, those vehicles which use the highways most and cause the greatest wear and tear on them will bear the heaviest burden.

Four Years' Profits Compared

T HE Federal Reserve Bank of New York has made a study of the profits of 122 manufacturing and merchandising concerns in ten groups for the past four years, taking those of 1919 as 100 per cent. The average for the ten groups was 94 per cent in 1920; 25 per cent for 1921 and 83 per cent for 1922. The only groups showing an actual loss in '21 were motors and accessories, stores and miscellaneous industrials, although food and food products and miscellaneous metals and oils almost reached the vanishing point.

Only eleven motor and accessory concerns are considered, however, so the findings can scarcely be considered really convincing. Their profits came back to 68 per cent last year. It is significant that this is 15 points below the average, thus proving that the industry was content with a lower margin of profit. Foods came back to 105 and stores to 98.

It is interesting to note that public utilities rose steadily year by year to 162 in '22. The same was true of tobacco, which went up to 137 last year. Class I railroads earned 19 per cent more in 1921 than in '19 and 50 per cent more in '22. Their lean year was 1920, when profits went down to 11 per cent of the preceding year.

OUTLOOK BRIGHT FOR APRIL AND MAY

REPORTS on business conditions in the automotive field from all sections of the country, together with analysis of other data presented in this issue of **AUTOMOTIVE INDUSTRIES** as the first of a series of monthly economic surveys, indicate a probable continuance of record business for April and May.

Altogether the situation may be summarized as follows:

- (1) The sales position is good for the next month or two. Beyond that, the retail trade are not willing to commit themselves at the moment.
- (2) The truck and tractor sales are increasing in the important centers of their operation. Truck sales have not yet broadened out to the full requirement, but the gain is steady and the outlook for spring is good.
- (3) Raw material prices will need watching very carefully, as they are advancing more rapidly than the general commodity prices. Credit sales in a few instances indicate a desire for longer credit and easier terms, which may indicate tighter money situation among consumers if the tendency grows.
- (4) Automotive stock prices show a considerable advance above average industrials and indicate that the financial trade is optimistic regarding the immediate future of the business.

In some of the sections there is hesitancy on the part of the farmer as yet and in other sections the advance in sales is not proportional through the various price classes. These conditional limitations do not affect the general opinion that passenger car business will continue to run into astonishing volume through the spring.

Reports of truck business are encouraging. From the larger centers the reports show a probable gain in the buying of commercial vehicles over the previous months which have already made marked progress.

From several of the larger centers there is some showing of a small accumulation of open models which should lead to a larger comparative sale of these types in the immediate future.

With the backward conditions this season from a farming standpoint, the outlook for the next two months is dis-

tinctly optimistic for tractors in comparison with the previous year.

Credit sales are noted in one or two reports as showing a desire for smaller deposits and longer time arrangements. These slight hints of inflation require careful follow-up from the factory in the estimate of the summer position.

General business is good and the outlook favorable to its continuance, provided the inflation can be kept down. Credit sales, forming as they do so large a part of the business, are a good barometer of tendency and the statements made regarding them in one or two of the reports are not entirely satisfactory.

Manufacturers can secure a good deal of encouragement from the used car improvement. Generally reports indicate a freer market in used cars and a better position on allowances.

The sales possibilities for April and May are very good. Raw material prices are increasing. In the last month the index shows that the prices of the principal raw materials in the automotive field have crossed the general index as shown by Bradstreet and tend to advance more sharply than the general cost of commodities.

Up to the present month automotive manufacturers have been able to buy their principal materials with a decided advantage against the general cost of commodities.

During March this favorable condition changed and the prices now represent a disadvantage in that comparison. The problem of profits and sales prices is, therefore, becoming more acute.

This situation should be read also in connection with the credit sales position reported from some of the buying centers.

If the prices of automotive products are advanced and there is any widespread tendency to ask for smaller deposits and longer terms on credit sales, the large sales prices are likely to have a limiting effect upon the credit sales at a later period.

The stock prices show the reaction of the financial trader to the automotive sales outlook. It is evident that the stock market operators look upon the automotive business as presenting profitable possibilities of great importance in the next few months.

Conditions in chief distributing centers as reported by correspondents of **AUTOMOTIVE INDUSTRIES** are as follows:

New York

NEW YORK, April 4—Not only new cars, but used car sales are running strong in the metropolitan area. Distributors and branches handling the more popular cars are far behind, both on wholesale and retail deliveries, and the demand for new cars in all lines is gaining strength every day.

The used car outlook is particularly cheerful. Almost universal employment in the city and surrounding territory is bringing back into the market many people in the lower salaried and artisan classes who have not been buying for the past two years. Over-winter stocks of used cars are being cleaned out rapidly and those being taken on current trades are not remaining long on the salesroom floors.

Demand for trucks continues to gain month by month.

Sales of replacement parts, accessories and shop equipment are gaining as might be expected with the continued increase in motor vehicle registration.

Boston

BOSTON, April 4—Motor dealers in the New England territory are very optimistic now that the snow has been banished from many of the highways. There are more demonstrations being booked, and more prospects are dropping around to look over the cars and talk trades.

There is no question but that there is big business in sight for the next two months. New cars are beginning to arrive in better quantities, trainloads landing here about every day.

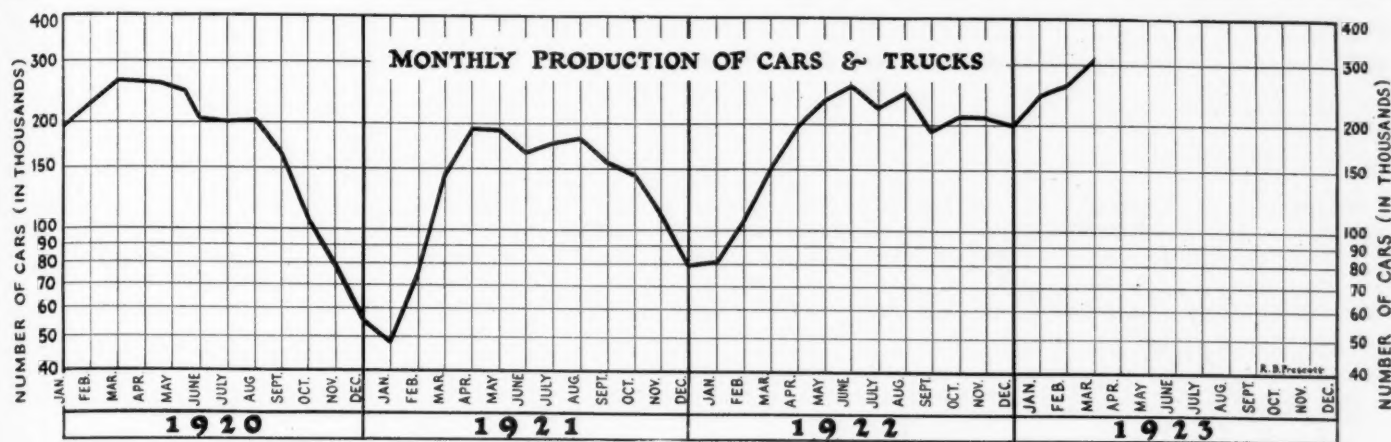
Chicago

CHICAGO, April 4—Retail sales of automobile in Chicago and Cook county have been mounting steadily this month, although the rate of advance has been somewhat retarded by the extremely unseasonable weather which has been prevailing here.

The demand, however, in the popular low price field has been such as to tax the ability of dealers and branches to deliver. Prospects for the next month are that if the weather is at all seasonable the buying that has been dammed up by the cold will break with a flood that will create a new record for retail sales. Used cars have been moving with surprising celerity, due to intensive advertising by dealers.

(Conditions in other cities on page 789)

OUTPUT LAST MONTH REACHED 346,000



First Quarter Total Shows 228 Per Cent Gain Over Last Year

NEW YORK, April 4—All previous production records were smashed last month, the report for March as filed with the directors of the National Automobile Chamber of Commerce at their monthly meeting today, showing that 346,000 cars and trucks were manufactured in March by American makers. This beats the previous high water mark of 289,011, made in June, 1922, by 84 per cent. It is 128 per cent better than February, 1923, when 275,769 vehicles were turned out and 200 per cent more than March, 1922, produced.

While it had been expected the last half of March that the record would be smashed, few looked for any such astonishing total. It was thought that possibly 300,000 would be reached.

While the March report was sensational, that for the first quarter of 1923 was just as surprising. The percentage of increase of the quarter just ended over the same quarter a year ago was 228 per cent. It is still more startling to realize that this March produced 90 per cent as many vehicles as was manufactured in the whole first quarter of 1922.

Output for Quarter 882,672

The count for January, February and March of this year is 882,672 in comparison with 386,195 for the same months in 1922. This January had 240,903 in comparison with 91,109 in January, 1922, an increase of 265 per cent. This February, with 275,769, was 222 per cent better than 1922 February, with 122,366, while the two Marches line up with 346,000 in 1923 to 172,720, which was reported in 1922.

Naturally with production records be-

INDUSTRY SHATTERED ALL PRODUCTION RECORDS WITH ITS TOTAL OUTPUT FOR MARCH

NEW YORK, April 4—Shipping figures compiled by the National Automobile Chamber of Commerce give an estimated production for March of 346,000 cars and trucks, the greatest monthly production in the history of the industry, besting the 289,011 of June, 1922. It is an increase of 128 per cent over February, 1923.

The following table gives the statistics for January, February and March and for the months of 1921 and 1922.

	Output				Carloads				Driveaways				Boat			
	1923	1921	1922	1923	1921	1922	1923	1921	1922	1923	1921	1922	1921	1922	1923	1921
January	240,903	6,485	15,357	33,900	3,185	7,479	31,400	93	143	800						
February	271,000	9,986	19,636	35,700	7,507	10,173	42,760	99	180	900						
March	346,000	16,287	27,753	43,774	9,939	16,917	58,320	75	560	1,900						

Factory shipments for the other months of 1921 and 1922 and output for 1922 follow:

	Output		Carloads		Driveaways		Boat	
	1922	1921	1922	1921	1922	1921	1922	1921
April	219,558	20,187	31,334	14,197	22,381	1,619	2,960	
May	256,219	18,608	33,416	15,193	28,827	2,381	7,406	
June	289,011	20,269	34,230	18,834	33,857	3,947	7,737	
July	245,414	19,514	29,116	15,533	28,100	3,726	7,030	
August	273,425	20,758	32,814	15,218	36,754	3,595	10,096	
September	205,784	19,002	25,950	13,840	30,055	2,959	8,002	
October	238,514	17,808	26,980	12,971	33,320	2,226	7,040	
November	235,854	14,264	27,232	10,528	27,376	1,402	5,070	
December	226,556	12,100	26,900	7,500	27,500	134	1,300	

ing broken in this manner, shipping figures also showed a big jump. James S. Marvin, head of the traffic department of the chamber, reported 43,774 carload shipments in March as compared with 35,700 in February and 34,230 in June, 1922, the previous record month. Driveaways increased from 42,760 in February to 58,320, while 1900 went by boat this March in comparison with only 900 in February.

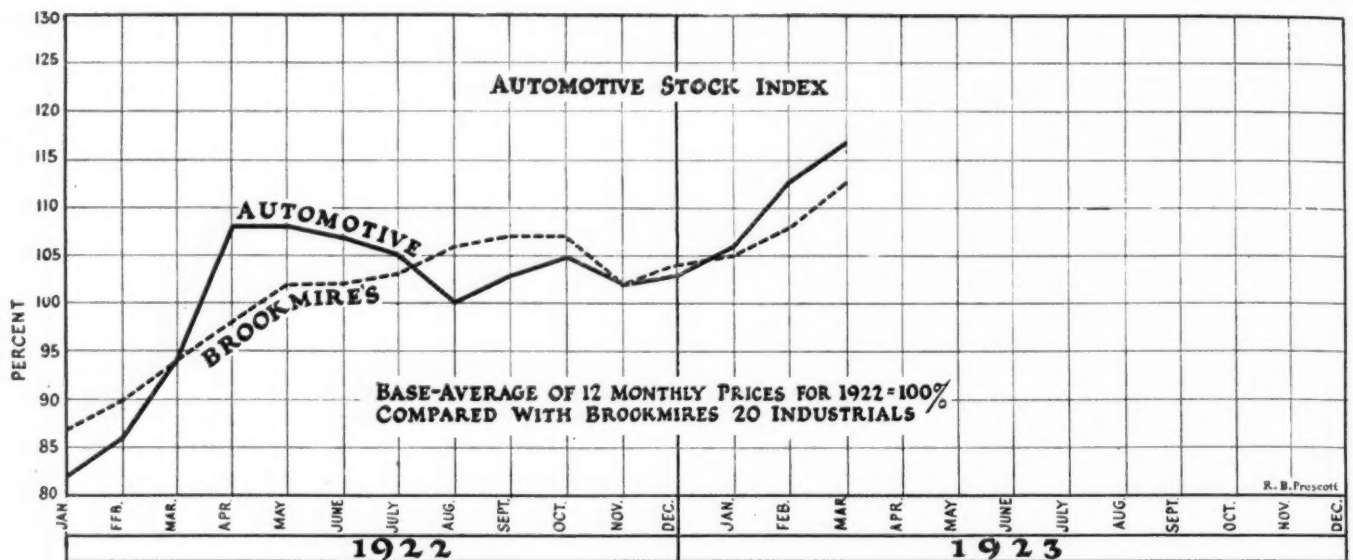
The railroad situation shows some improvement, and it is felt that there will be fewer delays now that winter is over. However, there is fear that if this record-breaking business keeps up, which is unseasonable, there will be a shortage of freight cars in the late summer and fall, when the transportation demand is greatest. Still there are many new freight cars on order, and when they are put into service these expected difficulties may be avoided.

Rocky Mountain Sales Advanced During March

DENVER, April 4—One dealer reports that his business is fifty per cent better than a year ago and 100 per cent improved over last month, with sales during the next six weeks likely to run ahead of the factory allotment. This report is similar in tone to the experiences of other dealers. One retailer, for example, has tripled his March sales of a year ago and is short on certain models. The trading situation has improved.

This favorable situation applies to the entire Rocky Mountain territory, with the outlook exceptionally bright provided weather and road conditions develop as expected for the next six weeks or so. This prediction is based partly on extra large sales during this week in particular, which has been marked by balmy weather.

AUTOMOTIVE STOCKS SETTING PACE



Stock Quotations Listed on Exchanges Throughout Country

New York Exchange

Ajax Rubber	133 3/8
American Bosch	50 1/2
Am. La France	12 1/4
Brunswick	2 1/4
Case, J. I., pfd.	79
Chandler	70 3/4
Continental Motors	9 1/2
Fisher Body	183
Fisher Body pfd.	120
Fisher Body rts.	18
Fisher Body of Ohio	99
Fisk Tire	14
Gen. Motors	143 3/4
Gen. Motors pfd.	85 1/2
Gen. Motors 6%	86 1/4
Gen. Motors 7%	100 3/4
Goodrich	38 1/2
Goodrich, B. F., pfd.	90
Goodrich pfd.	50 1/2
Hayes Wheel	39 1/2
Hendee Mfg.	21 1/2
Hudson	297 1/8
Hupp Motors	277 1/8
Kelly-S Tire	59 1/2
Kelly-S 8% pfd.	105
Kelsey Wheel	107
Mack Truck	85 1/8
Mack Truck 1st pfd.	96 3/4
Marlin-Rockwell	12
Martin-Parry	32 3/4
Maxwell Motors A	57
Maxwell Motors B	18
Moon Motors	23 1/2
Mullins Body	25 1/4
Nash Motors	108 3/4
Packard	15
Parish & Bingham	13
Pierce-Arrow	13
Pierce-Arrow pfd.	317 1/8
Pierce-Arrow pr pfd. w. i.	70
Reynolds Spring	23 1/2
Spicer Mfg.	22
Stewart-Warner	120 5/8
Stromberg Carb.	86 3/4
Studebaker	122 1/2
Studebaker Corp. pfd.	113
Timken R. B.	42
U. S. Rubber	62

U. S. Rubber 1st pfd.	103 1/8
White Motor	56 5/8
Willys-Overland	7 1/2
Willys-Overland pfd.	60 7/8
Wright Aero	9 1/2
American Chain	25
Electric Stor. Bat.	64
Emerson Brantingham	5
Emerson Brantingham, pfd.	28
Goodyear	96 5/8
Lee Rubber	28 3/4

Cleveland

Firestone	83
Firestone, 6% p.	95 1/2
Firestone, 7% p.	97
Grant Motors	1/8
Jordan Motors	285
McGraw Tires, p.	1/2
Miller Rubber	103
Miller Rubber, p.	104
F. B. Stearns	22 5/8
Torbenson Axle	27 3/4
Victor Rubber	6
Winton Motors	24 3/4

Chicago

Bassick-Alemite	37 1/2
Continental Motors	9 1/2
Hayes Wheel	40
Hupp Motor	27 1/2
Mitchell Motors	2
Reo	16 5/8
Stewart Warner	121 1/2
Yellow Mfg.	280
Borg & Beck	31 1/2

Boston

Hood Rubber	59 1/2
Waltham Watch B.	11
Mercer Motors	13 1/4
Gardner Motors	13 3/4
Gray & Davis	12 1/4
Hood Rubber	59
Simms Mag.	1

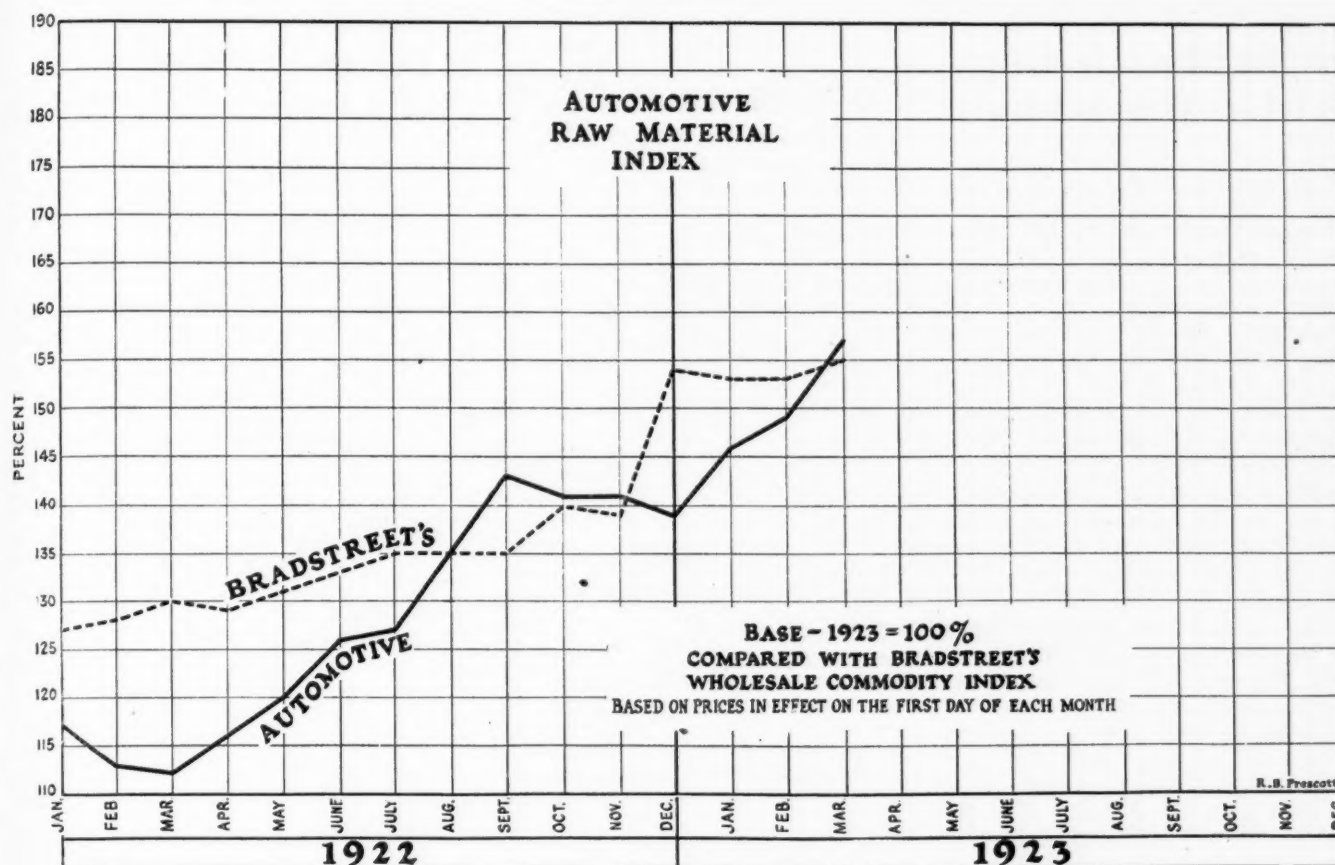
Detroit

Auto Body	3 1/2
Bower	9 1/2
Charcoal Iron	2
Columbia	3 1/4
Columbia, p.	3 1/2
Continental	9 5/8
Edmunds & Jones	26 3/4
Edmunds & Jones, p.	96
Federal	27 1/2
Ford Canada	456
Hoover	60
Hall Lamp	26 1/2
Hayes Mfg.	4 3/8
Michigan Stamping	19 1/4
Michigan Drop Forge	21
Motor Products	98 1/2
Motor Wheel	11 1/2
Murray Mfg.	17 3/8
Packard, com.	15
Packard, p.	94
Paige	21 1/4
Reo	16 5/8
Reynolds Spg.	23 1/2
Timken Axle	12 3/8
U. S. Radiator, com.	56
U. S. Radiator, p.	90

New York Curb

Gardner Motors	137 1/8
Goodyear Tire, com.	15 3/4
Peerless Motors	59 3/4
Reo Motors	16 3/4
Stutz Motors	18 1/4
Hood Rubber 7s '76	101 3/8
Cleveland Motors	29 1/2
Ford Canada	450
Motor Wheel	11
National Motors	1
Timken-Det. Axle	12
Willys Corp. 1st pfd.	9
Torbenson Axle	27 1/8
Durant Motors	59 1/2
Mercer Motors	1 1/4
Paige-Detroit	21 1/2
Republic Rubber	5
Springfield Body	50 5/8

MATERIAL COSTS ABOVE GENERAL LIST



Reports from Leading Cities Show Good Sales Conditions

Louisville

LOUISVILLE, Ky., April 4—During the last two months Louisville automobile dealers have enjoyed the best season in the history of the trade. Heavy buying began with the opening of the automobile show in February, and since then the majority of the distributors have been unable to obtain enough cars from the factories to meet the demand. Hundreds of unfilled orders are on the books and purchasers are clamoring for deliveries.

Business was never better and there is every indication that it will continue excellent throughout the year. Almost without exception, the dealers are optimistic over the future.

Dallas

DALLAS, TEX., April 4—Actual retail sales of automobiles in the Dallas district for the first three months of the year showed an increase of about 20 per cent over that of the same period a year ago. The selling is brisk right now, and dealers expect it to continue so for another month.

Dallas dealers do not count sales made until cars are delivered. They have a considerable number of orders booked for

delivery in April. The business will probably be slow in May and June. A close estimate gives the number of cars retailed in Dallas during March at 900. The number was larger than that in February. The dealers are optimistic. Prospects for a good crop are in evidence and that will mean banner business in the summer, fall and winter.

San Francisco

SAN FRANCISCO, April 2—Automobile sales in northern California for March and for the first quarter of 1923 showed a gain of approximately 25 per cent over those of the same month and quarter of 1922, according to leading dealers here. Cars priced at \$2,000 or under moved faster during March than did cars priced above that figure, and a tendency is apparent among buyers to make smaller payments down and take longer periods to pay out.

Rains after the long dry spell at the end of March saved the grain, fruit and vegetable crops, which materially increased the demand for low-priced cars. April gives indications of being a better month for sales than March.

Tractor sales show some improvement over February of this year and also over March of last year.

Birmingham

BIRMINGHAM, ALA., April 4—The States of Alabama and Mississippi, the northern part of Florida and the Memphis and Chattanooga sections of Tennessee are enjoying the greatest business in the sale of cars since the slump of 1920. This condition is expected to continue for some time and certainly until the last part of May. The sales during January in the larger portion of the territory were ahead of anything during the year of 1922. Still larger sales are expected during April and possibly May.

These conditions are particularly true of the Birmingham and Mobile territories.

Seattle

SEATTLE, Wash., April 4—The automobile retail trade situation in Seattle is exceedingly good for standard makes of cars, and the next few months look even better. Especially pleasing is the larger demand from the farming sections and tributary sections in the Pacific Northwest.

(Conditions in other cities on page 799)

Plants Feeling Scarcity of Material

Output May Be Kept Within March Limits

Orders Warrant Bigger Production—Ford Establishes 6000 Daily Schedule

DETROIT, April 2—The most important single fact on April production in the Detroit district is that the Ford Motor Co. is now definitely established on a schedule of better than 6000 cars daily and will operate through the month at from 6300 to 6400 a day. The first 6000 day was March 27 with 6105 and this was followed the next day with 6134. The sales department reports business fully warranting this output and advises that orders still are far ahead. March business will aggregate between 140,000 and 150,000.

In reaching the new totals Ford has the advantage of its many assembly stations, which permit it to recruit additional help in all parts of the country. Companies doing all manufacturing and assembling in Detroit are at a disadvantage in that there is little surplus labor available in this city. Though all parts for Ford are made and machined in the two big plants here, the concentration on this work rather than on assembly makes possible higher production without large additions to the working force.

Labor Situation Figures

There is an opinion among plant executives that March production will mark the general high point of the year. This is because the labor and material situation is such that it is practically impossible to go beyond March totals. Although most factories report orders warranting higher output for April they declare it next to impossible to make increases because of difficulty in getting material even on the present basis.

Many of the smaller companies which have been operating on less than capacity schedules will increase totals in April but the big producers will remain at practically the same figures. A peculiarity of the situation is that companies planning additional factory space are unable to get structural steels, just as they are unable to get increased quantities of automobile steels. This situation will result in holding back factory expansions for this year at least.

Business in Brief

NEW YORK, April 5—Marked increase in retail buying in industrial centers has featured business of the past week or so. This has brought with it a corresponding increase in the jobbing trade. Continued bad weather conditions have delayed retail expansion in the farming communities of the country; but at that there has been a sizable volume of business transacted.

The steel industry is working feverishly to supply the demands for material placed by the building trades and automotive industry. Prices continue strong. Reports from Pittsburgh indicate something approaching a runaway market in the iron and steel industry. The paying of premiums for prompt delivery continues.

Warning signals continue to be displayed. There is no doubt but that they have a salutary effect. Advancing of the rediscount rate by the Federal Reserve Board failed to materialize in spite of many rumors to that effect. A policy of caution prevails in conservative circles.

Car loadings for the week ending March 17 aggregated 904,286 or a decrease of 933 cars from the week previous. Loadings continue to be far in excess of those of the same period last year.

Confusion and uncertainty ruled the stock market during the past week. The resulting reaction served to place the market on a sounder basis. Speculative shares showed weakness in many instances. Bonds continued their downward trend. Bank clearings showed a slight decline from the previous week.

Chevrolet is concentrating all its activities on production of its Superior models, the problem being entirely one of distribution. With acquisition of the Janesville plant, production is mounting upward from the 1500 daily mark. Work at the Flint plant was hindered several days in March by storms which temporarily tied up the power house serving manufacturing plants in that city.

Buick, Studebaker and Dodge Brothers continue to operate in excess of 600 daily. Hudson-Essex is operating on a schedule of about 350 daily. Maxwell-Chalmers schedule is for about 300 a day.
(Continued on page 795)

Bigger Truck Sales Expected This Month

Companies Report That Business Is Increasing in Agricultural Districts

NEW YORK, April 2—Reports from all branches of the automotive industry for March indicate an unprecedented forward movement, continuing in a marked degree the improvement that was noted in February. With a new output record established last month in the volume of cars and trucks, major automobile manufacturers are continuing operations along March levels, and, in instances, surpassing them.

During the early part of March car and truck manufacturers operated on schedules approximately 17 per cent greater than those followed through the previous month, turning out a total in excess of 300,000. June of last year, with its 289,011 output, most closely approached last month's figures and up to this time set the highest production figure for any month. Estimating March production at 300,000, the total output for the first quarter will aggregate 816,772, as against 386,195 for the same period of last year.

Output Being Absorbed

This output is being readily absorbed, no stocking up beyond the actual demand or sales in sight, with dealer or manufacturer, being apparent. At the same time, used cars are moving rapidly, a considerable improvement being reported in this phase of the dealer's business, and facilitating the disposal of new products.

The greatest gain this month is expected in truck production. Farmers give unmistakable signs of having returned to the buying market for motor equipment, both trucks and tractors, and although it is unlikely they will purchase as extensively as in other years, they will make a good start toward becoming a leading factor in 1924. Truck companies are reporting increased sales in the agricultural districts, with a continuance of a healthy demand in large industrial centers.

Parts makers are feeling the pressure of business, with unfilled orders on hand April 1 in excess of those at the beginning of March. Plant facilities are being expanded.
(Continued on page 795)

Directors Abrogate Goodyear Contract

Hereafter Company Will Make
Salary Arrangement Direct
with President Wilmer

AKRON, April 3—The contract negotiated by the Goodyear Tire & Rubber Co. with the Leonard Kennedy Co. of New York, under the terms of which the Kennedy company was paid \$250,000 a year for supplying Goodyear with a president and treasurer, and which was made the basis for six suits filed by Goodyear stockholders attacking the legality of the company's entire reorganization program, has been completely abrogated and annulled by Goodyear directors, effective June 1.

Last November, after Mrs. Laura T. Weiss as a Goodyear stockholder had filed suit attacking the legality of this contract and of other features of the reorganization, directors of the company abrogated the original contract and negotiated a new contract with the Kennedy company. This new contract continued the \$250,000 annual payment, but eliminated the clause providing for a 5 per cent bonus to be paid the Kennedy company on profits between \$10,000,000 and \$20,000,000 a year.

The latest action of the directors in abrogating the contract completely follows the settlement and withdrawal of the Weiss suits, in which two directors had joined. When the contract expires June 1, it is understood that Goodyear will make salary arrangements direct with E. G. Wilmer, who has been re-elected president of the company.

Ford to Make 7600 Wheels at Its Hamilton Factory

DETROIT, April 2—Ford Motor Co., is increasing production at its Hamilton, Ohio, plant to a schedule of 7,600 wheels daily, somewhat less than one third its requirements for all cars. In addition to wheels this plant is reported now making 100 different parts for cars and trucks, principal of which are rear radius rods, running boards and brackets, tire carriers, battery carriers, fuel tanks, hubs and flanges.

Present consumption of steel at this plant is about 325,000 lb. daily and there are about 1,500 employees. New departments are being added from time to time. Except on wheels, the company reports that all other parts made at Hamilton are in quantities corresponding to complete production of Ford cars and trucks.

ASHLAND TIRE SOLD

CLEVELAND, April 2—Ashland men, headed by Charles D. Darrah, general manager of the Reliable Match Co., have bought at the court sale the plant and assets of the Ashland Tire & Rubber

Flat Rate System of Repairs Is of Benefit to Owner as Well as to Manufacturer of Car

By HARLOW N. DAVOCK,
Service Manager of the Packard Motor Car Co.

Detroit, April 3.

THE policy in servicing motor cars and the design of the cars for service are the features that are most important today in making for the popularity of the car and for determining whether the company shall be a leader or an unimportant factor in the industry.

Unless a company so designs the mechanical features of its product that it is readily accessible for service, and backs this up by a service policy which permits owners to get proper maintenance attention at low cost, it cannot expect its car to enjoy a high reputation for utility and cannot occupy an important place in the industry.

Since automobiles have established themselves from a utility standpoint the question of service has been the most important one for manufacturers to consider. Under the utility impulse, designs of engines and other units have undergone extensive change, looking toward decreasing of parts and general improvement of the vehicle as a whole.

The inauguration of the flat rate system of repairs has been important in many respects for the manufacturer. Its most important effect has been to increase owner satisfaction, and this redounds in greater business for the factory. As factory production grows it becomes possible for owners to participate in lower prices and better quality not only on finished vehicles but on service parts.

There is a reciprocal relation between high factory output and owner utility that holds true for every company in the industry, and although the initiative in this respect came from the lowest priced car manufacturer, manufacturers in the quality class have come to realize that this is the foundation upon which all future business must be established.

The flat rate system has enabled factories to guarantee owners a definite maintenance basis, and through it they have also been able to help dealers by giving them a fixed basis on which to operate. Dealers unable to profit under the flat rate know that their maintenance system is wrong and can bring their departments up to date by improved methods and machinery.

With a flat rate system in operation the factory is enabled to get many valuable tips on economies from dealers, because it promotes an experimental spirit. Where any dealer succeeds in making an improvement in time or labor saving methods it is passed on to the factory and, if satisfactory, is adopted through the entire sales organization. Factory engineers and service experts are constantly engaged in seeking improved methods but the help supplied from dealers is extremely valuable.

Substitution of spurious parts must be carefully guarded against by factory service heads because their use in service will destroy the reputation of the car despite all efforts of manufacturers to build it up. Parts that give way should be replaced with the most reliable material that can be obtained because different driving styles impose special stresses at varying points.

If a factory tested part gives way in a car and a spurious part is substituted it stands to reason that the second part will give way sooner. Repetition of this experience speedily destroys confidence in a product.

Co., with the exception of cash on hand and notes and bills receivable. The upset price was \$125,000, and the Darrah bid was the only one received.

C. G. SPRING IN NEW PLANT

DETROIT, April 2—C. G. Spring Co. started production today in a new plant in Kalamazoo which practically duplicates the one burned last week and gives the company opportunity to resume on a complete schedule immediately. Within two weeks the company will be at peak and spring deliveries will suffer little interruption.

FISHER BODY LETS CONTRACT

DETROIT, April 4—A contract has been let for the erection of the new Fisher Body Corp. plant at Pontiac, which will make bodies for the Oakland Motor Car Co. division of General Motors Corp.

Harley Foundry Buyers Will Manufacture Parts

SPRINGFIELD, MASS., April 3—The Springfield Malleable Iron Co. has been formed with \$250,000 capital by the Worcester interests that bought the Harley foundry here.

It is purposed to double this capitalization by issuing \$250,000 in preferred stock to provide funds for a building enlargement, new machinery and equipment and working capital. H. P. Blumenthal is general manager of the concern, which is to manufacture automotive parts and other castings.

MAKE PLANS TO BUY HUBBELL

CLEVELAND, April 2—R. J. Shindler of Cleveland and associates have completed plans to purchase the Hubbell Tire & Rubber Co., formerly the Trumbull Tire & Rubber Co. of Newton Falls.

White Sales Gained \$6,947,277 Over 1921

**Current Assets Reported Nearly
Four Times as Great as Current
Liabilities**

CLEVELAND, April 2—Following the preliminary report given out several weeks ago, the annual statement of the White Motor Co. shows gross sales for 1922 of \$37,268,226, representing a gain of \$6,947,277 over the preceding year.

The net profit for the year is reported to be \$3,770,617. After the addition of sundry adjustments amounting to \$28,791 and the deduction of \$2,000,000 paid in dividends, a balance of \$1,799,409 was carried to surplus account, making the total surplus \$4,461,073. Bank loans were reduced from \$3,600,000 in 1921 to \$2,000,000 in 1922, with an increase in cash from \$1,346,441 to \$2,528,966.

The company carries customer paper without discounting, so that the current assets, listed at \$22,122,904, and current liabilities, \$5,661,830, are shown in their actual ratio of 3.9 to 1.

Included in the current assets are inventories \$11,140,501; notes receivable (customers), \$5,104,179; accounts receivable (customers), \$3,287,323; cash in banks and on hand, \$2,528,966 and miscellaneous accounts receivable, etc., \$63,966. Current liabilities include notes payable for money borrowed, \$2,000,000; accounts payable for purchases, payrolls, expenses, etc., \$3,463,186; deposits on trucks, \$123,672 and accrued real and personal taxes \$74,971.

During the past year the company's service organization has been further strengthened by the completion of new service stations in Chicago Minneapolis, St. Louis, Kansas City and Memphis, and by the addition of stations at St. Paul, Oakland and Houston. Altogether there are forty-seven service stations in this country and Canada.

Duesenberg Motors Elects L. M. Rankin Its President

INDIANAPOLIS, March 30—L. M. Rankin, former vice-president, has been elected president of the Duesenberg Automobile & Motors Co.; James McElhinny has been chosen secretary-treasurer, and General Manager Chester Ricker and Sales Manager F. C. Scudder have been elected directors.

The elevation of the executives is considered by the company in the light of well-earned rewards. Rankin has been in charge of financial and business management of the company since its inception. Ricker, consulting engineer, joined the organization during 1922, and as general manager has increased the plant output steadily. Scudder is said to have been highly successful in building a sales organization during recent months.

COLE "NO TRADE" PLAN TOLD OTHER DEALERS

INDIANAPOLIS, March 30—An unusual type of dealer meeting was staged at the plant of the Cole Motor Car Co. here yesterday when thirty-five motor car merchants who do not handle Cole came to town to hear about the company's "no trade" plan. Practically all of the dealers had first written the factory to learn about the new plan.

The convention was evolved to tell the story to all the interested dealers in a group, and invitations were sent out, to which thirty-five responded.

L. B. Sanders, secretary of the Boston Used Car Statistical Bureau, presented the dealers with used car facts and figures.

The second unit of the plant recently taken over is now well equipped and in operation as a final assembly and finish building, and the company anticipates the need of a third unit to be erected soon to still further facilitate production.

Stratton to Drop Monroe Roadster and Add Coach

INDIANAPOLIS, April 2—Stratton Motors Co., which has taken over the Monroe plant and assets, announces that the only important immediate change in the policy of the Monroe will be the elimination of the roadster and the addition of a coach model, which is to be priced at about \$1,100.

The full list of officers is now available. It includes Frank S. Stratton, president; Frederick E. Barrows of Connersville, vice-president, and Frank A. Kately, New York, secretary and treasurer. In addition to the officers, the directors are Alvin A. Gloetzner of New York and Edward E. Gates, attorney of this city, who is advisory counsel for the corporation.

American Bosch Reaches Highest Point Since War

SPRINGFIELD, MASS., April 3—The American Bosch Magneto Corp. is now at its highest mark in production since the war period. Night shifts are being operated in its assembling and other departments.

Ignition apparatus has led in the expansion, it being stated that the plant has approximately 20,000 unfilled orders for the new Ford ignition outfit recently put on the market. Magnetos, the other main line produced at this plant, also have contributed substantially to the increase.

At the Gray & Davis plant in Cambridge, operations of lighting and starting units are said to be at capacity.

New High Mark Set in Packard Profits

**Report Made for First Half of
Company's Fiscal Year Shows
Net of \$4,435,559**

DETROIT, April 4—Net profits of the Packard Motor Car Co. for the six months ended Feb. 28, the first half of the company's fiscal year, were \$4,435,559, according to a semi-annual statement. This is the high mark in the company's history; in 1920, the previous high year for earnings, net profits for the full twelve months were \$6,276,863.

After making allowances for the payment of \$5,915,500 outstanding bonds which have been called for redemption April 15, net current working assets were \$27,658,399, or about ten times current liabilities. Holdings of cash and United States Government securities, after allowing for bond redemption, were \$9,497,431.

The company's balance sheet shows that two cash dividends of 2 and 5 per cent respectively were declared during the six months' period and also a common stock dividend of 100 per cent was declared. The surplus account now stands at \$7,969,583. Expenditures during the six months for tools and other plant equipment were \$1,216,670. The company is turning over its inventories every two months and common stock now has a book value of \$13.35 a share.

Plant of Michigan Steel Will Be Ready June 1

DETROIT, April 2—Officials of the Michigan Steel Corp., report plans for the beginning of operation of the new Detroit steel mills by about June 1. High grade steel sheets for the automotive trade will be made there. It had been hoped to begin operations in the spring but inability to get deliveries on structural steel for the buildings caused reconsideration of plans.

The main building covering the hot mills, pickling, annealing, cold mills and finishing departments, will be 900 by 115 ft. An initial output of about 3,000 tons of steel sheets monthly is planned. About 500 men will be employed at the start. When equipped the plant will represent a cost of \$1,000,000.

Officers of the company are Frederick B. Lovejoy, chairman of the board; George R. Fink, president; Frank H. Jones and H. M. Steele, vice-presidents; E. R. Milburn, secretary; and S. R. Kingston, assistant treasurer.

AMERICAN COMMERCIAL SALE

DETROIT, April 2—Sale of the American Commercial Car Co., manufacturer of the Wolverine truck, has been postponed until April 18 at 11 a. m. The sale was scheduled for March 30.

Liberty Plant Sale Put Over to April 10

Interests Favorable to Percy Owen
Make Bid and Request
Postponement

DETROIT, April 3—Sale of the Liberty Motor Car Co. property has been postponed one week, to April 10, at the request of Henry B. Joy, president of the National Bank of Commerce, the only person who, by posting a certified check one day in advance, was qualified to bid. In requesting the postponement Joy said that he desired to discuss the details of reorganization with other interested persons before taking definite steps to acquire the property.

Although Joy declined to commit himself as to the interests associated with him, he intimated that these were favorable to Percy Owen, president of the present company, and that Owen's views would be considered in the discussions he plans to hold. No one was qualified to bid for Edward Verlinden, former president of Olds.

With the postponement of the sale the receiver was of the opinion that additional bids may be entered prior to the new sale date. The Joy bid was filed twenty minutes over the time limit, and this week's action was delayed twenty minutes by that technicality. In filing the bid Joy said he was influenced by the fact that no bids had been entered, and he was actuated by a desire to "get the wheels turning" before the company was allowed to disintegrate further.

The upset price of the property is \$1,175,000. The financial statement lists assets at \$1,673,535 and liabilities \$1,601,262 exclusive of stock. Joy said he expected to take the matter up with his associates and with Owen on their return to this city.

Body Maker Economizes by Centralized Control

NEW YORK, April 4—Centralized control is one of the keystones of the building of custom and semi-custom bodies by the newly organized Springfield Body Corp. Economies effected in this manner will represent 7½ per cent of the sales price of its products, it is figured. With a yearly capacity in three plants of 25,000 jobs a year and an average sale price of \$600, this means a million dollar saving a year, it is estimated.

Describing this plan, Vice-president A. H. Wolfe says:

At present our plan is being applied to three plants, at Springfield, Mass.; Bloomfield, N. J., and Pontiac, Mich. Ordinarily the three would operate as individual businesses, with three sets of officers, three designing and three engineering departments, etc.

Now there is a single set of executives and a single staff for designing, engineering, purchasing and sales, with a reduction of 50 per

UPSETS CAB BOAST BY RAISING FARES

CHICAGO, April 3—Taxicab fares in Chicago were increased this week by the Yellow Cab and other companies by the addition of five cents to the initial charge, making it twenty-five cents for the first half mile.

Other charges of ten cents for each additional half mile and twenty cents for each extra passenger were not changed. Yellow Cab recently published advertisements declaring it was much cheaper to use Yellow Cab service than to operate one's own car.

cent in personnel and a consequent saving in salaries. It has been possible to employ more capable men in every department than would be practical with a smaller yearly production. Combining the purchasing power of three plants has effected additional economies.

Sample bodies on all large orders, together with patterns, including cradles and, of course, working drawings, are made at the Springfield plant and sent to the other factories with production orders for quantity of each job which is to be produced in each plant. Therefore, a superintendent constitutes the sole executive personnel at the other manufacturing units.

Factory of Elgin Motor Ordered Sold on April 26

CHICAGO, April 3—Sale at public auction on April 26 of the plant and assets of the Elgin Motor Car Corp. was ordered yesterday by the United States District Court. The sale will take place, beginning at 11 a. m., at the plant of the corporation at Argo, suburb of Chicago. The Elgin company has been in receivership since last October, and several attempts at reorganization by a committee of stockholders have failed.

The property to be sold and the value at which it has been appraised are as follows: Office furniture and fixtures, \$8,194; machinery and factory equipment, \$23,000; material and parts inventory, \$63,000; real estate and buildings, \$340,000, the aggregate appraisal being \$434,194. The property is subject to first liens of approximately \$150,000. Unsecured claims aggregate \$800,000. The company is capitalized at \$5,500,000 and has approximately 1700 stockholders.

COATS STEAM REORGANIZED

COLUMBUS, OHIO, April 2—A complete reorganization of the Coats Steam Car Co. has been made with Conrad Kipp, Greenville, Ohio, president; M. A. Pixley, first vice-president; T. E. Moore, second vice-president and general manager; G. P. Hickie, secretary and treasurer, and George W. Mannix, Jr., chairman of the board of directors. In addition to the officers, members of the board are A. L. Henry and P. A. Kern.

Studebaker Outlines Big Plant Expansion

New Buildings Under Way and
Contemplated Will Mean
Outlay of \$5,250,000

NEW YORK, April 3—No change in personnel was made at the annual meeting of the Studebaker Corp., held here today, and all directors were reelected. The stockholders listened to reports which told of exceptional business in the first quarter of 1923 and were told of building expansion plans for the present year.

Expenditure of \$5,250,000 is called for in the 1923 building program, and when this work is completed by Jan. 1, 1924. Studebaker will have capacity in keeping with its expectations. A new manufacturing unit is being constructed at South Bend, the largest building to cost \$1,500,000.

A new foundry, also to be built in South Bend, which will produce all Studebaker castings, will cost \$3,000,000 and will be one of the largest and most modern in the country. In addition about \$750,000 is being spent on a New York service station. On March 1 the corporation had 23,000 employees, 12,500 being at South Bend and the remainder at Detroit.

Earned \$28.35 a Share

The financial report showed that the corporation in 1922 earned \$28.35 a share on the 600,000 shares of outstanding common and produced 37,500 cars in the first quarter of this year, on which net profits, after deduction of taxes, exceeded \$5,000,000, equivalent to \$6.75 a share on the 750,000 shares of common stock now outstanding. Exports approximate 13 per cent of the current production, which is now about 650 cars a day.

Speaking on prices, President A. K. Erskine said:

"Advances in the prices of iron, steel, tires, glass, leather and other materials entering into the construction of automobiles have already advanced considerably the cost of production and caused increases in prices by some makers. Further increases in material or labor cost will lead to general increases which will inevitably check the sale of cars and react on the whole industry and the employment situation. For these reasons advancing prices are to be deplored."

Manufacturer of Pumps Opens Agency in France

PARIS, March 25 (By mail)—R. N. Goode, formerly Packard representative in France and later attached to the New York organization of this company, is establishing in France as representative of the Wayne Oil Tank & Pump Co. of Fort Wayne, Ind. The French concern will handle not only gasoline storage pumps for garage and curb distribution, but oil and gasoline storage in factories.

Men of the Industry and What They Are Doing

Scheuer Heads Kelly Tire

A. L. Scheuer, chairman of the board of directors, has been elected president of the Kelly-Springfield Tire Co. to fill the vacancy caused by the retirement of Alfred B. Jones several weeks ago. Scheuer has been actively identified with the management of the Kelly-Springfield company for the past twelve years.

Metcalf American Bosch Treasurer

The American Bosch Magneto Corp., Springfield, Mass., at a meeting of its board of directors, elected as its treasurer, Maurice Metcalf, formerly vice-president of the Universal Portland Cement Co. of Chicago, and more recently president of the International Steel Corp. of New York. Metcalf succeeds George A. MacDonald, president of the Chicopee National Bank of Springfield, who will retain his place as vice-president and director in the Bosch organization.

Daly Succeeded by Willoughby

Walter E. Daly has resigned as vice-president in charge of sales of the Columbia Motor Car Co. because of ill health and will take a long rest before resuming business activity. Complete charge of the sales department of the company will be taken over by D. J. Willoughby, who has been sales manager up to this time. The resignation of Daly was tendered several months ago and is effective April 1.

Burridge Returns to South Bend

L. Earl Burridge has resigned his position as advertising manager of the Barley Motor Car Co. and will engage in a sales enterprise at his former home, South Bend, Ind. Frank Webb, of the Kalamazoo Gazette, has been named as his successor.

E. L. Vail Resigns

E. L. Vail, for the past ten years manager of the automotive division of the Waltham Watch Co., has retired from that organization, his contract, which had two years to run, being cancelled by mutual consent. Vail has made no plans for the immediate future other than that he intends taking a good vacation before getting back into harness.

Goodrich Makes Promotions

W. A. Johnson, manager of pneumatic tire sales of the B. F. Goodrich Co., has been promoted to the position of merchandise manager. The new position is created under the reorganization of the executive sales personnel of the Goodrich company. A. G. Partridge, for many years vice-president of the Firestone Tire & Rubber Co., who has been with Goodrich for the past eight months in a spe-

cial executive sales capacity, succeeds Johnson as pneumatic tire sales manager. H. M. Bacon, formerly with the old Diamond Tire Co., prior to its merger with Goodrich, is moved up to Partridge's place as manager of all branch operations. He has been manager of western district tire sales. L. A. McQueen, sales promotion manager, becomes advertising manager, succeeding E. D. Gibbs, who resigned April 1. Gibbs, who formerly was advertising manager of the National Cash Register Co., will open New York offices as a counsellor in advertising and sales.

Tainsh Made Kissel Sales Head

John Tainsh, for the past nine years general sales manager of the Mitchell Motors Co., has been appointed vice-president in charge of sales of the Kissel Motor Car Co. of Hartford, Wis. In making this selection, President George A. Kissel regarded as a valuable asset Tainsh's nine years of Mitchell service, which, plus several years of executive, sales and advertising work in other lines, gives Tainsh a close familiarity, not only with the automotive industry, but with the theory and practice of merchandising in general.

Peninsular Products Names Nutting

C. A. Nutting, formerly master mechanic and efficiency engineer of the Briscoe Motor Co., and recently superintendent of the Case Manufacturing Co., is now affiliated with the Peninsular Products Co. in the capacity of sales manager.

On Federal Distributors' Board

Thomas E. Reeder and M. L. Pulcher, president and vice-president respectively of the Federal Motor Truck Co., have become members of the board of directors of the Thompson Auto Co., Federal distributors in the Detroit district, as part of a program of expansion of the distributing company.

Probst Quits as Engineer

Karl Probst has resigned as chief engineer of the Milburn Wagon Co. of Toledo. No announcement has been made as to his future plans.

Gladfelter in Own Business

Robert Gladfelter has resigned as general manager of the Kalamazoo body plant of the Dort Motor Car Co. to enter business for himself. Gladfelter has been with the Dort company since its organization.

Lowry Names Holliday

J. W. Holliday has been appointed assistant sales manager of the Lowry & Blackman Co., Atlanta, manufacturer of steering wheel locks.

Ferguson Succeeds Smith

R. R. Ferguson has been appointed sales manager of the Mercer Motors Co. of Trenton, N. J., succeeding W. A. Smith, who after ten years' service is retiring from the company. Ferguson has been a member of Mercer's wholesale force, covering the Ohio territory.

Hale Resigns as Sales Manager

Sydney H. Hale has resigned as sales manager of the Vim Motor Truck Co. of Philadelphia after a connection with the company extending over a period of more than eight years. Prior to joining the Vim selling organization he had been identified for almost an equal length of time with the H. J. Kohler Co. of Newark, N. J., starting as a city salesman and winding up as sales manager. He has not announced his plans for the future.

Frey in Safety Work

Frank A. Frey, assistant works manager, Geuder-Paeschke & Frey Co., Milwaukee, manufacturer of metal stampings, has been appointed chairman of the industrial safety section of a newly organized division of industrial and public safety of the Milwaukee Association of Commerce as a reorganization of the former safety division. The general organization is being remodeled by E. L. Philipp, former governor of Wisconsin and prominent Milwaukee manufacturer, who has been elected president.

Morgan Manages Pilot Sales

G. C. Morgan, formerly general sales manager of the Earl Motors, has been appointed general sales manager of the Pilot Motor Car Co., Richmond, Ind.

R. J. Middleton Resigns

R. J. Middleton, for the past ten years service manager for the Muskegon plant of the Continental Motors Corp., has resigned and is leaving for a six weeks' visit to California.

Briggs Appoints Griffith

Harry Griffith, formerly general manager of the Midwest Engine Co. and previously general manager of the Remy Electric Co., has become assistant to Walter Briggs, president of the Briggs Manufacturing Co.

Body Maker Appoints Millar

Thomas H. Millar, Jr., has been appointed chief engineer in charge of the manufacture of custom made bodies at the Galvin & Gilmour Body Corp. plant.

Pontiac Honors Hannum

George H. Hannum, president of the Oakland Motor Car Co., has been elected president of the Pontiac Board of Commerce.

American-La France Opens Truck Factory

Completes Experimenting at Elmira, N. Y.—Will Produce at Bloomfield, N. J.

NEW YORK, April 2—The American-La France Fire Engine Co., Inc., of Elmira, N. Y., has taken possession of its new factory at Bloomfield, N. J., which will be devoted exclusively to the production of motor trucks, thus marking the entry into a new field for which the company has been preparing for the past four years.

The new plant is under the direction of C. K. Ball, works manager, and production has started on two of the five models the company is preparing to manufacture. Delivery will start in June and before December the company expects to turn out 130 of the 3½-ton models at \$4,950 and the 5-ton at \$5,500. The 2-ton will not come through until some time in October and the three-quarter and one-ton models will not be put into production until next year.

The American-La France company has been in existence seventy-eight years, first making steam fire engines, but turning to gasoline in 1909. For a time it experimented with motor trucks using the Manly hydraulic drive, but it was not until four years ago that it seriously tackled the truck manufacturing problem. This has been under the direct supervision of President J. R. Clarke and the experimental work has been done at the Elmira plant.

Bigger Truck Business Is Expected This Month

(Continued from page 790)

ties are being taxed to the utmost by the insistence of directions for immediate shipment. Capacity operations will continue for several months at least. In this branch of the industry, as in other branches, operations have been hampered somewhat by the shortage of skilled labor. Collections continue with practically no variation from satisfactory conditions existing during the past months.

There has been little change in the rail situation, but seasonal conditions will do much toward helping deliveries to and from factories. Lake boat service which started April 1 will relieve the railroads to a certain extent both in the shipment of finished cars to distributing points and of parts and material to car manufacturing centers.

Improved conditions in some countries are reflected in the greater volume of exports of automotive products. The year is traveling along at a rate two or three times greater than that maintained during the same period in

FEBRUARY SALES OF M. A. M. A. MEMBERS GAINED 6.75 PER CENT OVER PRECEDING MONTH

New York, April 2—Reports from members of the Motor and Accessory Manufacturers Association show that sales in February increased 6.75 per cent over the preceding month, the total purchases amounting to \$48,518,700.

The following table shows the sales by members of the association, the total past due accounts and the totals of notes held for all of 1922 and the first two months of 1923:

	Total Sales	Per Cent Change	Total Part Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
1922						
January ...	\$17,320,000	20.61 Inc.	\$4,450,000	5.45 Inc.	\$3,146,000	7.02 Dec.
February ..	22,720,000	31.17 Inc.	4,070,000	8.57 Dec.	3,483,000	10.74 Inc.
March	28,670,000	26.14 Inc.	2,890,000	28.86 Dec.	2,657,000	23.69 Dec.
April	33,830,000	18.70 Inc.	3,000,000	2.00 Inc.	2,500,000	1.05 Dec.
May	43,700,000	28.06 Inc.	2,900,000	2.75 Dec.	2,450,000	6.05 Dec.
June	42,000,000	3.85 Dec.	2,840,000	1.25 Dec.	2,320,000	5.00 Dec.
July	41,001,670	2.42 Dec.	3,423,850	20.42 Inc.	2,217,670	4.49 Dec.
August	43,700,000	5.00 Inc.	3,705,000	8.21 Inc.	2,398,350	8.15 Inc.
September..	37,300,050	13.36 Dec.	4,220,400	13.91 Inc.	2,658,000	10.86 Inc.
October ...	39,753,800	3.90 Inc.	3,463,850	17.93 Dec.	2,603,100	2.09 Dec.
November ..	36,616,850	5.51 Dec.	4,245,850	22.58 Inc.	2,442,700	6.15 Dec.
December ..	34,711,630	5.20 Dec.	3,494,850	17.69 Dec.	1,905,650	21.98 Dec.
1923						
January ...	\$45,451,950	30.94 Inc.	\$2,469,950	29.33 Dec.	\$1,945,850	2.11 Inc.
February ..	48,518,700	6.75 Inc.	2,741,100	10.82 Inc.	1,981,950	1.86 Inc.

1922, and further healthy progress in foreign trade for the remainder of the year is indicated.

Factories Are Feeling Shortage of Material

(Continued from page 790)

day. Paige-Jewett with an output of about 4,700 cars in March is continuing on this same schedule. Hupp with its new plant in operation has a schedule of approximately 180.

Cadillac continues to lead in the high priced field with an output in excess of 100 while Packard is building about 100 daily. Wills Sainte Claire is being operated by the receiver on a schedule of 250 monthly pending the culmination of the company's reorganization plans.

Reo has a schedule of about 150 daily in cars and speed-wagons but was compelled to operate on part time in some departments in March owing to delays in material delivery. Oakland and Oldsmobile are approximating 125 to 140 daily.

Durant schedules at Lansing call for production of 300 Stars and Durant fours daily, the first-named approximating 75 per cent of the total. Gray is operating at capacity in its present plant units.

DURANT TO EXPORT 1000 CARS

NEW YORK, April 2—Durant Motors is paying considerable attention to export business and during the month of April plans to ship 1000 Durants and Stars from the Long Island City and Elizabeth plants to thirty-three cities in twenty-three foreign countries. The two largest shipments will go to Buenos Aires, Argentina, and Christiania, Norway, the former getting 246 Stars and nine Durants and the latter 205 Stars and twenty Durants.

Rauch & Lang Makes More Gasoline Cabs

CHICOPEE FALLS, MASS., April 4—Rauch & Lang is expanding its production of gasoline taxicabs, and reports enough orders on hand to keep the plant busy for the next four months. These cabs are now being made at the rate of two a day, with the prospect of this rate being increased to three a day by May 1. Production schedules call for 600 to 750 gasoline and 150 to 200 electric taxicabs for the present calendar year.

The output of gasoline cabs thus far has been sold entirely to operators in New York and Boston. The Belltaxi Co. of New York, which operates Rauch & Lang cabs, exclusively, has a fleet of about 100, and another large New York company has recently placed an order for 50, part of which have been delivered.

Paul A. Frank has resigned as president of the company to devote his entire time to directing sales of the gasoline cab, spending the greater part of his time away from the home office. R. W. Stanley succeeds to the presidency, along with fulfilling the duties of general manager.

Nash Will Limit Output in 1923 to 60,000 Cars

KENOSHA, WIS., April 4—Declaring that orders and demands from distributors would seem to warrant a production of 100,000 Nash cars this year, C. W. Nash, president of the Nash Motors Co., stated that production would be limited to 60,000 cars.

"I have no idea of letting our plants get into a jam," Nash said. "I propose to build only as many cars as we can build well."

Tractor Makers Wary About Giving Prices

Uncertainty of Situation Makes
Frequent Changes Possible,
Says One of Them

CHICAGO, April 2—Considerable uncertainty as to tractor prices appears to exist among the manufacturers, according to information received from more than a dozen producers. Only about half of the companies were prepared to state prices at which dealers may buy tractors. Most of the companies giving prices stated that they were confidential and not for publication.

One company, in saying that it is not its policy to public prices when they are subject to change, quotes prices in effect April 1, showing a considerable increase.

Another company says: "We are not giving out prices of our tractors and other machinery, as conditions are such that it may be necessary for us to change them from time to time, and we do not think it a wise policy to have them published broadcast."

It is impossible to publish prices of tractors, says one company, "for, as a matter of fact, prices vary in different parts of the country in order to meet different special conditions. For instance, the length of time the dealer wants to take in paying for the machine makes a difference in the price, for there is a very material difference for spot cash and time, and the longer the time the higher the price."

Another company says it does not care to list prices "owing to the uncertainty of the present price situation."

Kalamazoo Truck Makes Another Price Increase

KALAMAZOO, April 3—Kalamazoo Motors Corp. announces a further increase in the prices of its trucks. The change does not affect the entire line. The new price increases vary from \$390 on the 1-ton delivery model to \$50 on the 5-ton. On Dec. 11, 1922, all Kalamazoo products were advanced in prices, the increases at that time ranging from \$155 to \$300.

The revised schedule is as follows:

Model	Old Price	New Price
T 1 Ton.....	\$1,295	\$1,685
GL 1½ Ton.....	2,100	2,100
LG 2 Ton.....	2,645	2,775
NH 3 Ton.....	3,350	3,350
HD 3 Ton.....	3,350	3,500
SK 4 Ton.....	4,000	4,000
OK 5 Ton.....	4,500	4,550

MAHLON S. LONG DIES

AKRON, April 3—Mahlon S. Long, former president and one of the founders of the Portage Rubber Co., which was purchased by F. M. Seiberling, died at his home here.

FACTORY SEEKS BOYS AS JUNIOR SALESMEN

DETROIT, April 3—Rickenbacker Motor Co. is cooperating with its Detroit distributing company, Cunningham-Richards Co., in a plan to arouse interest among boy high school students in the automotive industry generally and to promote the sale of Rickenbacker cars.

The factory cooperation will consist largely in throwing the plant open to the students' inspection and detailing an executive to take the boys through in groups and explain operations.

With the interest of the boys aroused, the distributing company plans to enlist from their ranks junior salesmen who will receive remuneration for assistance given in the sale of cars. The plan has received the approval of principals and will be instituted at once.

"Uncle Sam" Price Cuts Range from \$245 to \$450

MENASHA, WIS., April 4—The U. S. Tractor & Machinery Co. announces reductions ranging from \$245 to \$450 in the price of the "Uncle Sam" tractors. The following is the revised list.

		Old Price	New Price
C-20	12-20	\$1,235	\$ 990
B-19	20-30	1,985	1,585
D-21	20-30	1,895	1,485

Higher List Announced for All Jewett Models

DETROIT, March 31—An increase in the prices of all Jewett cars has been announced by the Paige-Detroit Motor Car Co., effective April 1. All open models have been advanced \$70, while the closed cars are \$30 above the old price.

The following are the latest prices:

	Old Price	New Price
3-pass. roadster.....	\$995	\$1,065
5-pass. phaeton.....	995	1,065
5-pass. sport phaeton.....	1,095	1,165
4-pass. coupe.....	1,445	1,475
5-pass. sedan.....	1,465	1,495

The company is offering two new Jewett models, a special coupe and sedan, priced at \$1,625 and \$1,695 respectively.

American Truck Lists Advance \$150 to \$300

NEWARK, OHIO, March 31—The American Motor Truck Co. manufacturer of the Ace truck, has announced an increase in price of its three models. The new prices, which vary from \$150 to \$300 above the old schedule are as follows:

Model	Old Price	New Price
Model 20, 1½-ton.....	\$2,400	\$2,550
Model 40, 2-2½-ton....	2,850	3,100
Model 60, 3-ton.....	3,400	3,700

Material Costs Cut Timken Axle Profits

End of Year, However, Shows
Current Assets Greatly Ex-
ceeding Liabilities

DETROIT, April 3—In his first report as head of the Timken-Detroit Axle Co., President Fred Glover attributes the small profit of 1922 to taking a large volume of passenger car business at extremely low prices to fill the plants, and to sharp increases in the cost of material during the last six months of the year. Though the volume of business was 100 per cent in excess of 1921, he declares the net result disappointing in that the dividends paid on preferred were only partly earned, the balance coming from the surplus.

Moderate Profit This Year

Readjustment of selling prices as of Jan. 1 resulted in a moderate profit in the first two months of 1923, he said, and with much greater volume in March, profits should increase proportionately. Indications are that the present satisfactory volume will continue through the year. The truck business, he said, is improving rapidly and demand for motor bus axles is active and encouraging. From the present rate of production, the volume should be considerably in excess of 1922, he said.

The financial condition of the company is satisfactory, Glover said, current assets of \$8,666,136 and current liabilities of \$3,086,721 leaving a net working capital of \$5,579,414. Part of the plant investment which stood at \$10,056,237 is now shown as a receivable of \$923,520. Glover said, occasioned by the sale of the Malleable Iron plant at Canton to the Dayton Malleable Iron Co. This item is not recognized as current assets, he said, owing to the provision for monthly payments in sales terms over an extended period. The remaining items under "other assets," while good, will be of low liquidation and are omitted as current assets.

Book Value of Stock \$15.55

Glover notes that a common stock dividend of 150 per cent was paid Nov. 20 and that the surplus account now stands at \$4,122,544, making a book value of \$15.55 a share for the 742,906 shares of common outstanding Dec. 31. Concluding, he says that the organization in both office and factory is efficient and working in the utmost harmony and looking to the future with confidence.

Total assets are listed at \$19,483,505, permanent assets being the largest item with \$9,298,779. Inventories on hand and in transit are \$6,597,452. Aside from stock, the largest item in the liabilities is \$2,100,000, a current liability of notes payable for borrowed money. Accounts payable not due are reported to total \$941,240.

Temporary Receiver Appointed for Bijur

Court Will Take Action on Making Receivership Permanent on April 16

NEW YORK, April 5—Vice Chancellor Bentley of Jersey City, who last Saturday appointed John Milton temporary receiver of the Bijur Motor Appliances Co., yesterday postponed until April 16 the question of making the receivership permanent.

The temporary receiver was named upon the application of Harry Bijur, who alleged that the majority stockholders of the company planned to turn over to the Eclipse Machine Co. of Elmira, N. Y., "a monopoly on the automobile electric starters made by the Bijur company."

It was asserted by the petitioner that the present Bijur company was formerly known as the Bijur Motor Lighting Co., and that when it was reorganized in 1918 it received financial assistance from the General Electric Co., which then became the majority stockholder.

A meeting of stockholders was held March 23, at which, it is said, a resolution was passed calling for the sale of the Bijur assets within ten days.

General Electric May Buy Plant

It is understood that the court action on April 16 will clear the atmosphere. If the temporary receivership is dissolved, it will permit of the holding of the proposed sale of the assets, and the plant will go to the highest bidder. If the General Electric Co. acquires the property at this sale, it is reported that the deal with the Eclipse Machine Co. will be consummated.

Prior to the last Bijur reorganization, the Eclipse company won a decision over Bijur in litigation over electric starter patents, with the result that the two companies manufactured virtually the same products. Bijur claimed in his petition that the Eclipse company made as much as \$1,000,000 a year, while the Bijur company was obliged to close its factory a year ago.

Bids too Low for Sale of Six Standard Plants

CLEVELAND, March 29—Six remaining plants of the Standard Parts Co. and the stock of the Bock Bearing Co. of Toledo that were put up at public sale today were not sold because the bids received were unsatisfactory to the receiver. It is understood that the plants will be sold later at private sale.

Members of the syndicate that bought the springs and service divisions of the company state that until certain details are completed the names of the persons who will operate the Perfection Spring and the Pontiac Spring companies cannot be announced.

APPEAL TO MOTORISTS TO REDUCE ACCIDENTS

NEW YORK, April 3—The Automobile Merchants' Association of New York has undertaken a campaign to improve traffic conditions in the metropolis. The first step is the use of billboards urging the motorist to respect the rights of pedestrians and on billboards in and about the city the first message has already appeared, as follows:

"Motorists: Respect the Rights of Pedestrians. Automobile Merchants' Association of New York."

Other messages will appear from time to time and later on will be addressed to pedestrians, urging them to exercise care in passing through motor traffic.

20,277 Cars Shipped by Overland in March

TOLEDO, April 3—Shipments of cars from the Willys-Overland Co. plant in March totaled 20,277, the largest month in its history. For the first quarter of 1923, 44,478 cars were made, nearly three and a half times as many cars as were turned out the first quarter of last year.

Willys-Knight shipments for the first quarter equalled the total shipments of these cars for the entire last year and, at the present rate, will exceed the 1922 production by the middle of May.

President John N. Willys predicts an unprecedented business for his company this year and states that retail orders now on file with dealers far surpass records at the same date for any season in the history of the company.

Hupp Limits Shipments to Early Year Contracts

DETROIT, April 3—Hupp Motor Car Corp. sales in the first three months of the year totaled 12,034, the largest quarter's business the company has ever enjoyed.

March business aggregated 5034, which exceeded last June by about 1000. Export sales in the quarter were reported to be the greatest since the record business in the latter part of 1920.

As a result of heavy business, the company has been forced to confine all shipments strictly to the basis of contracts signed by distributors at the beginning of the year. Sales are reported to be running considerably in excess of production, and it will be impossible to increase any shipping specifications for at least three months.

Sales in each of the first three months ran far ahead of any similar months in the company's history, January doubling any previous January, February exceeding the best previous February by 158 per cent and March 160 per cent better than its best predecessor.

André Citroen Here with Sahara Caravan

French Maker Figuring on Establishing Plant Here to Make Cars

NEW YORK, April 5—André Citroen, known as the Henry Ford of France, accompanied by fifteen of his engineers and executives, arrived on the Olympic yesterday for a three weeks' stay in the United States for the purpose not only of studying American conditions, but also to look into the possibilities of establishing a factory in this country for the manufacture of Citroen cars on this side of the Atlantic.

"I have not fully made up my mind but I am going to investigate prices, locations, and learn the markets, and if everything is favorable I will start a factory here in the course of the next year or eighteen months," said Citroen. "I am not committed to Detroit by any means, and I am going to look around before making up my mind."

Selling Many Taxicabs

Citroen is particularly interested in the taxicab situation. He denies the rumor that an American concern is figuring on buying 5000 taxicabs from him but he is going to go after American business for the cab which he brought out a year and a half ago. At the present time there are 2500 in operation in twenty-five cities in all parts of the globe. It is of 10 hp. with a 46 in. tread, doing about 40 miles to the gallon, he claims. It will sell in this country for about \$1100, complete.

With the Citroen party came twelve Citroen cars and seven of the caterpillar tread vehicles which conquered the Sahara Desert recently. In the party is the inventor, M. Keggresse. This machine can travel at the rate of from 10 to 20 miles an hour and is quiet in operation.

The Citroen factory hopes to turn out 35,000 cars this year, which will equal the production of all other French factories combined, it is claimed. Next year it is hoped to make 45,000 and the year after, 60,000.

Citroen will be in this country for three weeks, spending the first week in New York City, then going to Detroit for a week and returning to New York for the third week, during which time he will run over to Philadelphia for a short visit. Friday night of this week he will exhibit moving pictures of the Sahara trip under the auspices of the Society of Automotive Engineers.

Employs Modern Methods

Citroen comes to America as no stranger because of his meteoric career in France. Interested principally in gear production before the war, he came into the limelight between 1915 and 1918 as one of the biggest shell producers in

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SALES GOOD, SAY N. A. C. C. DIRECTORS

Limited Production Forecast at Meeting

Steel Situation Fairly Satisfactory —Producers Not on Capacity Basis

NEW YORK, April 5—The general feeling among the directors of the National Automobile Chamber of Commerce who attended the monthly meeting yesterday was that the automobile business will continue good, but that production may be limited by the material situation, the demand for closed bodies and plate glass being so heavy at the present time that a scarcity may result shortly.

The steel situation is described as fairly good. Steel plants, it is reported, are not running to capacity, largely because they will not bid for labor.

As to the retail situation, all reports show that trade everywhere is exceptionally good. March sales were generally 50 per cent better than February, with the rural business much better than last year and plenty of early buying. Light trucks are selling exceptionally well, while the demand for heavy trucks in the large cities is fairly good.

Demand for closed cars runs from 33 to 90 per cent, the latter being reported from one town in Kansas. Used car demand runs from slow to good, but mostly fair, with good used cars in demand.

The N. A. C. C. directors accepted an invitation to appoint a committee of three to cooperate with Secretary Hoover of the Department of Commerce in his investigation of the rubber situation. The directors are reported to be opposed to any plan which artificially restricts supply or increases prices.

The next monthly meeting of the N. A. C. C. directors will be held in Detroit May 2, following the usual custom.

Aircraft Maker Brings Suit for \$51,500,000

WASHINGTON, April 5—James V. Martin of Long Island has filed suit under the Clayton Act to recover \$51,500,000 from the Manufacturers' Aircraft Association, Inc., twenty-seven other corporations and thirty-eight individuals.

Martin claims that his business as an airplane manufacturer has been damaged to the extent of \$17,000,000, and he wants triple damages, plus an attorney's fee of \$510,000.

He charges that the defendant corporation and individuals conspired to monopolize the aircraft trade.

GREAT LAKES OPENED TO BOAT SHIPMENTS

DETROIT, April 4—Boat service to Cleveland and Toledo was started this week for the 1923 season. Morning and night sailings are being made to Cleveland by the D & C boats and round trips to Toledo by the White Star line.

The Port Huron service will be started next week. The Cleveland boats carried large cargoes of automobiles for distribution in that territory and for driving away to points that are accessible from that city.

Included among the individuals named in the suit are Howard E. Coffin, Sidney D. Waldon, E. A. Deeds, Jesse G. Vincent, William B. Stout and Herbert M. Crane, all well known in the automobile industry.

Pierce-Arrow Shipments in March May Total 400

BUFFALO, March 30—March shipments of the Pierce-Arrow Motor Car Co. will be larger than those of any month since June, 1920, it was announced by Myron E. Forbes, president of the corporation, at the monthly meeting of directors.

Forbes said that the company expects to ship approximately 400 units this month. It is understood that close to 4000 men are now employed in the Elmwood Avenue plant.

A balance sheet which was before the directors at their meeting showed that the company at the beginning of 1923 had assets of \$24,943,901. At that time it carried a surplus of \$2,827,083. Current assets totaled \$13,804,092. Stock and notes outstanding at the beginning of the year totaled \$21,535,000.

Diamond T Names Reed Corporation Sales Head

CHICAGO, April 2—Diamond T Motor Car Co. announces the appointment of Rushmore B. Reed as manager of corporation sales for the company. Reed has been in the truck industry for seven years, having started as a salesman for the Diamond T company. He served later as Chicago branch manager for Diamond T and most recently as Chicago branch manager for the Republic Truck Co.

Conditions for the sale of trucks are more promising today than ever before, Reed said, upon assuming his new position.

Packard Plans Made for Flat Rate Test

Servicemen in All Company's Stations Will Take Part in Competition

DETROIT, April 3—Plans for the service contest to be held by the Packard Motor Car Co. call for the selection of operations from the 500 standard operations set forth in the flat rate system with prizes aggregating \$7,500, to be awarded the service organizations having the best average in these operations over six months. As now planned, the contest will be held in three separate series dividing the cities into general classifications according to service facilities of the sales organizations here.

Cities in Two Classes

Cities in the first classification are New York, Chicago, Philadelphia, Detroit, Boston and Pittsburgh. The contest will start with these at once and at the expiration of the six months will be extended to cities in Class B with whatever modifications or changes are found advisable in the first test. The prizes in each class are distinct and will be awarded the three top performers. It is the intention that all service workers share in these.

All service organizations must compete in the classes assigned, as the fundamental theory of the contest is to develop servicing to its highest point. Organizations will be left largely to their own initiative in methods of performing the operations, as one purpose of the contest is to develop new ideas making for economy and improvement of the present system.

Auditor to Check Operations

Twenty-five operations for each two months' test will be selected by the factory service committee. At the end of the two months a factory auditor will visit each organization and check back all its operations of this type. The best average time for the entire two months will be tabulated and these will be compared with the average on all operations. Winners will be those having the highest percentage of averages over the six months' period.

Though not a part of the contest, the factory points out that the plan will promote individual contests in each of the service stations among workmen, this being at the discretion of the service manager. All information on operations resulting from the contest will be received at the factory and will be studied by the service committee for adaptation.

CHIEF CITIES REPORT GOOD OUTLOOK

Milwaukee

MILWAUKEE, April 4—Although compelled to work against great odds and rather unusual obstacles throughout February and March, the retail passenger car trade in Milwaukee has come through both months able to show a reasonable increase in sales volume compared with the same months of last year. Prospects for April are considered exceptionally good as the result of the restrictions on trade imposed by a series of bad storms, from the effects of which the trade emerged only as March came to a close.

There is general talk of a shortage of cars by May 1, and this is not idle talk calculated to make prospective customers buy. Deliveries of cars to local distributors, who as a rule exercise jurisdiction over the entire State of Wisconsin and upper Michigan, have been below normal for sixty days.

Pittsburgh

PITTSBURGH, April 4—The extended cold weather in the Pittsburgh territory has deferred somewhat the spring buying of cars, although dealers of standard models have a comfortable number of orders. Business for the next six weeks is likely to be quite active due to the reserve list of buyers who are holding off until the warmer weather actually appears.

The industrial situation in the Pittsburgh territory is good, and local dealers are predicting a record year in the retail trade. This same aspect has resulted in smaller sums being offered for old cars in trades without much opposition on the part of the buyer.

Business thus far indicates that there will be a big increase this year in the number of those buying cars for the first time.

Detroit

DETROIT, April 4—Retail selling of new cars in the Detroit district is expected to continue at maximum, at least through April and May. Dealers in leading lines are selling cars now subject to a week to three weeks delay in delivery, amounting to practically a shortage, and it is not expected that the deliveries will catch up with the market before June 1.

Dealers decline to venture on the business outlook after June because of the extreme selling in the early months of the year. Dealers believe that the heavy early buying will cut down on later business.

There has been a large amount of trading in the business of the year to date without a counterbalancing movement in used cars. Dealers have plenty of used cars but are not burdened with

them. Nevertheless there will be a concentration upon clearing out used car stocks beginning about May 1, and this will have a tendency to slow the new car market.

St. Louis

ST. LOUIS, April 4—Retail sales are establishing high tide records for many dealers, and the outlook is such that it is reasonable to believe that this condition will continue well into mid-summer.

The demand for used cars is not such as would indicate a revival of the old-time wild trading policies, but a healthy consistent demand has made it possible for many dealers to make sales that they might have had to pass up six months ago. The buying of the medium and low-priced new cars is what gives the dealers the right to the claim that business is excellent.

The fact that the dealers from the smaller towns are coming to their distributors and driving cars back is another good indication. The situation as a whole is very encouraging.

Des Moines

DES MOINES, IOWA, April 4—Only the coldest weather of the winter and impassable roads have prevented automobile dealers of the Des Moines territory from doing a remarkable business during the month of March. For the past two weeks due to road conditions, any number of small town dealers were unable to get a car out of the garage. Despite these conditions, however, business has been far better than in either January or February, and there is a spirit of optimism generally among dealers.

The Des Moines show early in March was a decided stimulation to business, and there are bright prospects ahead. All that is needed now is ten days or two weeks of good weather and roads to set deliveries going. One distributor who has a large territory for a medium-priced car states that ten days of good weather will see the complete stocks in the hands of everyone of his dealers sold.

Buffalo

BUFFALO, April 4—Retail automobile trading in Buffalo shows improvement as compared with its condition a year ago. Sales have been at least 20 per cent greater during January, February and March of this year than they were in the corresponding months of 1922.

Several of the distributors incline to the opinion that there will be less trouble in selling cars this spring and summer than there will be in getting deliveries, especially with the most popular models.

Minneapolis

MINNEAPOLIS, April 4—The motor car business in the Northwest is strongly on the upgrade. Dealers generally report better business than at the same time in any previous year. There is no known reason why this business will not continue through the spring season. Minnesota is top hole. Montana is good in the copper and oil districts and not so good in the grain districts.

The Dakotas are doing well only in the larger places, and South Dakota having more of these is showing better returns than North Dakota. Business is about half and half as to four and six-cylinder cars, and a trade is growing for closed cars among the farmers. Truck sales are improving and tractor manufacturers are experiencing a better business.

Philadelphia

PHILADELPHIA, April 4—The automobile trade is in a particularly healthy condition, with sales good and improvement apparent. While the greatest demand has been for closed cars, there is an increasing demand for open models.

The rail freight car situation has not shown much improvement with the result that deliveries have been slow. Some local concerns report that they have been waiting for weeks for the delivery of between 100 and 200 cars a piece.

Light delivery trucks are selling well, but there is no appreciable movement of trucks of more than three-ton capacity.

There is every reason to believe that the next six months will see a continuance of remarkably good business.

Columbus

COLUMBUS, OHIO, April 4—Retailers and distributors in Columbus and central Ohio are much encouraged over the outlook for the spring and early summer. While the more popular priced cars are in the best demand, still there is a steady call for those ranging from \$2,000 to \$6,500. Cars in the \$1,200 to \$2,000 price class are selling briskly.

About the only hindrance to the general character of buying is the fact that farmers are not yet enjoying full prosperity, and buying from that source is somewhat curtailed. Dealers as a rule predict the best spring trade in the history of the business locally.

New Orleans

NEW ORLEANS, April 2—The retail trade is good and prospects indicate a greatly increased demand for the next two months. Used cars are moving better due to price reductions and a new trade-in policy forced by the heavy stocks.

André Citroen Here with Sahara Caravan

French Maker Figuring on Establishing Plant Here to Make Cars

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France. Breaking away from old-fashioned methods, he introduced the most up-to-date labor-saving appliances and organized his works to a degree of efficiency previously unknown in France. While Citroen was always ready to profit by the experience of foreign efficiency experts, and often had American engineers attached to his staff, his success in attaining higher efficiency was due principally to an intelligent application of these methods to local conditions.

Finding that French workers looked with suspicion on all new methods as an attempt to exploit them, his plan was to disguise the efficiency expert as a worker and let this man suggest to his companions that it was foolish to lift weights off the ground and put them back again, to carry parts from one shop to another, to have to walk a distance to get tools, etc., when all these operations could be done by automatic appliances.

In this way the men frequently petitioned for the introduction of a labor-saving device the factory was all ready to give them, and when installed the men made use of it as something provided for their special benefit.

Although he had never previously built a car, Citroen turned his munition factory into an automobile works immediately after the armistice and announced his intention of producing 100 cars a day.

Notwithstanding that he was a new-comer and consequently was looked upon with suspicion by the public, that he had no specialized technical automobile organization and did not possess a single dealer, Citroen was the first of the French automobile manufacturers to get into production, and at the present time has the biggest output of cars in France.

Used American Methods

His methods of marketing, which were largely American, at first amazed and then startled his competitors. It can be stated that until Citroen got into the field, the French industry had considered that buyers were only to be found among a limited and privileged class, and that this class would be influenced more by old established reputation than by the specific quality of the goods offered for sale.

Citroen set out with the idea that the mass of the nation was a prospective client, and he appealed to these prospects in a manner which, while common in America, was considered almost revolutionary in France.

This is the first occasion on which André Citroen has visited America since he became an automobile manufacturer.

SHORTAGE OF LABOR AIDS TRACTOR SALES

SAN FRANCISCO, April 4—Inability to get teamsters, either to drive gang teams on plows, cultivators and harvesters, or to handle wagon trains to and from the railroad stations, has turned the farmers of northern California to the tractor, which, with two men, can do the work of four teamsters and 16 to 20 horses.

The result is that the tractor distributors, dealers and salesmen are doing more business in the great interior valleys of northern and central California than ever before. George Moody, head of the California State Free Employment Bureau at San Jose, has just completed an investigation of the teamster situation, and the above is his conclusion.

Factory of Athol Rubber at Marysville, Purchased

DETROIT, April 4—H. Scherer & Co., manufacturer of automobile top fabrics, curtain lights and transparent sheets, has purchased from the Athol Manufacturing Co. the factory at Marysville, Mich., which manufactured a line of automobile rubber top fabrics.

The new owner has formed the Athol Rubber Co., with a main office here, and will operate the plant at Marysville. The company will have a capital stock of \$500,000, with \$350,000 paid in cash. The officers are: President, Hugo Scherer; vice-president, Clemons H. Davis; treasurer, Lovell R. Kraus; secretary, Hugo Miller, and factory manager, C. J. Strobel.

Ford Branch in Atlanta Now Turns Out 250 Daily

ATLANTA, March 30—From Jan. 1 to the present date has been the most active period in the history of the Atlanta branch of the Ford Motor Co., according to an announcement by W. W. Mitchell, manager of the branch, with indications promising that March will be the biggest month in gross sales the branch has ever experienced.

Since the first of the year 900 carloads of materials have been received at the branch, and nearly \$100,000 worth of materials purchased from Atlanta concerns, while 1650 carloads of completed Fords have been shipped out to dealers in this territory.

Production has now reached 250 per day, and this is to be further increased on completion of the addition now being constructed.

LEGISLATORS AT FORD PLANT

TORONTO, March 28—Forty members of the Ontario Legislature are inspecting the Detroit plant of the Ford Motor Co.

Quits Used Car Work to Join Cole Motor

L. B. Sanders of Boston Bureau Attracted by New "No Trade" Policy

BOSTON, April 3—L. B. Sanders, secretary of the Boston Used Car Statistical Bureau since its organization, has resigned to become direct factory representative of the Cole Motor Car Co. of Indianapolis, with headquarters in this city. Sanders is enthusiastic over the new Cole merchandising plan which eliminates all trading.

In speaking of the Cole plan, Sanders said:

This policy cuts the cost of distribution in half by eliminating the used car entirely from the new car business. It allows the dealer to conduct his business in the same way as any other merchant. It makes it possible for him to make a profit.

In my mind it is the logical solution of the whole problem.

In my capacity as secretary of the Boston Used Car Statistical Bureau, I was in constant touch with the dealer situation throughout the New England territory. I have preached, begged and implored all automobile dealers to beware of the used car evil if they expected to stay in business.

Statistics show that the rate of mortality among the dealers is increasing each year. In 1921 one out of every five dealers failed. In 1922 one out of every four dealers failed. What 1923 will bring forth I cannot say but I do know that the figures will be even worse than last year if the dealer does not see the handwriting on the wall. He cannot expect to succeed with the odds against him.

Out of 35,000 dealers in the United States only 2½ per cent made a profit out of the retail automobile business in 1922. And all because of the used car evil.

Gasoline Keeping Pace with Automobile Output

WASHINGTON, April 3—Stocks of gasoline were increased during January by 119,000,000 gallons. Figures compiled by the Bureau of Mines show that gasoline stocks on Feb. 1 were nearly 300,000,000 gallons in excess of stocks on the same day last year. The production figures indicate that the output of gasoline is keeping pace with the increased manufacture of automobiles.

The output of gasoline in January amounted to 623,823,337 gallons, a new high monthly record. The indicated domestic consumption of gasoline in January was 443,128,456 gallons.

PACKARD PROMOTES MCKINNEY

DETROIT, April 4—F. H. McKinney, manager of truck sales for the Packard Motor Car Co., has been named advertising manager and will assume his new duties at once. This position has been open for several months. R. D. Hughes, who has been acting advertising manager, has resigned to become advertising manager of the Kelvinator Co.

Tire Builders Take Most Rubber Supply

Use 464,136,363 Pounds of Total
of 570,376,141 Crude Ma-
terial Consumed

NEW YORK, April 2.—Sales value of rubber products in 1922 amounted to \$906,178,000, almost placing the American rubber industry in the billion dollar class. Of this total the automobile industry contributed more than half, with a sales value total of \$532,192,531, using 464,136,363 pounds of the total of 570,376,141 pounds of crude rubber consumed by the entire industry.

These statistics have been compiled by the Rubber Association of America, based on reports from 260 manufacturers, thirty-seven importers and dealers and six reclaimers, or approximately 90 per cent of the manufacturers and importers in this country, who produce and handle 97 per cent of the nation's rubber business.

105,239,778 Pounds to Other Users

A study of the report made by General Manager A. L. Viles of the Rubber Association shows the important part played by the tire industry. Of the total of 464,136,363 pounds of crude used last year, the industries other than tire makers used only 105,239,778 pounds, while the sales value of manufactured products of those other than tire makers amounted to only \$260,891,914 of the grand total of \$532,192,531.

Taking the report for the last half of 1922, tires and tire sundries lead in rubber consumption with 254,177,906 pounds, while trailing behind are mechanical rubber goods with 19,152,183 pounds; boots and shoes, 14,390,416; insulated wire and insulating compounds, 2,780,601; druggists' sundries, medical and surgical rubber goods, 3,722,457; waterproof cloth, clothing and rubber sheeting, 3,722,457; hard rubber goods, 2,982,030; heels and soles, 6,602,287, and miscellaneous, 6,081,856.

In sales values, tires lead with \$292,733,873; then come mechanical rubber goods, \$36,609,036; boots and shoes, \$63,295,472; insulated wire, \$14,649,875; druggists and sundries, \$6,484,900; waterproof cloth, \$9,841,162; hard rubber goods, \$5,099,916; heels and soles, \$9,641,813, and miscellaneous, \$8,637,956.

Increase in Employment

Viles states in his report:

A comparison of the two six months' periods of 1922 shows an increase in the number of persons employed in the industry from 110,104 to 146,330 and an increase in sales value of the products of approximately \$90,000,000. The recovery of the rubber industry would be even more evident if the efficiency of the manufacturing could be measured and compared with 1919 and the early part of 1920.

A further striking illustration of the recovery of the industry compared with condi-

MAKERS OF TIRES AND SUNDRIES IN 1922 USED 464,136,363 POUNDS OF CRUDE RUBBER

NEW YORK, April 2.—Statistics compiled by the Rubber Association of America show that manufacturers of tires and tire sundries used 464,136,363 pounds of crude rubber during the full year of 1922 and that the total sales value of shipments of the manufactured products was \$532,192,531.

The following table shows the number of pounds used and the sales value of shipments for six months' periods:

	1st Six Months		2d Six Months	
	No. of Pounds	Sales Value	No. of Pounds	Sales Value
Automobile and Motor Truck				
Pneumatic Casings	150,086,346	\$192,890,053	177,668,194	\$230,380,839
Automobile and Motor Truck				
Pneumatic Tubes	37,630,043	25,660,091	47,086,037	36,647,045
Motorcycle Tires (Casings and				
Tubes)	496,423	786,744	462,522	795,121
Bicycle Tires (Single Tubes,				
Casings and Tubes)	984,876	1,769,331	1,025,879	1,763,879
All Other Pneumatic Casings				
and Tubes, Not Elsewhere				
Specified	1,163,043	1,773,147	21,690	484,351
Solid Tires for Motor Vehicles.	16,668,395	11,132,417	24,929,437	16,744,067
All Other Solid Tires	487,334	572,814	300,277	454,326
Tire Sundries and Repair				
Materials	2,501,992	4,874,061	2,623,870	5,464,254
Total	210,018,457	\$239,458,658	254,117,906	\$292,733,873

tions prevailing in 1921 is reflected in the amount of crude rubber consumed. The figures for 1921 show 181,400 tons of crude rubber absorbed by the whole industry compared with 289,921 long tons in 1922.

The inventory of crude rubber in the United States and afloat for United States ports as of Dec. 31, 1922, showed a grand total of 89,759 long tons on hand and 45,780 long tons afloat.

68,900 Cars and Trucks Sold by G. M. C. in March

NEW YORK, April 3.—Production figures announced today by General Motors show that the preliminary combined sales of American and Canadian passenger and commercial car divisions of the corporation for March totaled 68,900. This compares with preceding months of a year ago as follows:

	1923	1922
January	49,162	16,088
February	55,560	20,869
March	*68,900	34,082
Total first quarter	173,622	71,039
April		40,474
May		46,736
June		48,541
Total second quarter		135,751

*This preliminary figure includes Buick, Cadillac, Chevrolet, Oakland, Oldsmobile and GMC truck.

Dissolution Authorized of Ryan-Bohn Foundry Co.

DETROIT, April 4.—The petition for the dissolution of the Ryan-Bohn Foundry Co., Lansing, has been allowed by Judge C. B. Collingwood and John W. Wilford, temporary receiver, was appointed permanent receiver. Opponents of the petition withdrew objections at the hearing.

14 District Meetings to Be Held by A. E. A.

NEW YORK, March 30.—District meetings of the Automotive Equipment Association in 14 cities of the South, Middle West and Canada were mapped out by the board of directors in session here during the past two days.

Meetings to be held in the Southeast will be in charge of Commissioner William M. Webster, in the Middle West and Middle South in charge of William E. Wisler of the Herring Motor Co. of Des Moines, vice-president of the association, and in Canada in charge of W. M. Morris of the American Chain Co. of Bridgeport, W. L. Moncur of Cutten & Foster, Ltd., or Toronto, and Wallace G. Page of the American Motor Equipment Co., Boston.

To Review Activities

It is intended, at these district meetings, to bring together both manufacturer and jobber members and to review the current activities of the association along the plan held at a recent meeting in Newark, N. J.

Cities in which meetings will be held are: Atlanta, Charlotte, Baltimore, Philadelphia, Memphis, Louisville, Richmond, Nashville, Birmingham and Montgomery, Ala., Charleston, W. Va., and Montreal and Toronto.

Meetings of the Northwest and Far West will be arranged later on. Those in sections already settled upon will be held in April and May, and officers or members of the board of directors will be present at all the meetings.

Final plans were made for bringing out the second edition of the Universal Catalog about November 1. It will be so arranged that jobber members can use pages in their own catalogs without the expense of typesetting.

Imports Last Year Declined from 1921

Report Shows, However, That
Number of Cars Brought Here
Gained in December

WASHINGTON, April 3—Sales of foreign-made automobiles fell off in this country in 1922, according to import statistics compiled by the Bureau of Foreign and Domestic Commerce.

The import data for the twelve months ending December, 1922, shows that 483 automobiles and chassis entered this country and were valued at \$802,888, as compared with 522 automobiles and chassis, and a value of \$876,163, for the same period in 1921. Despite the fact that the yearly totals showed a decrease, it is significant to note that the statistics for the month of December, 1922, showed a distinct gain in the value of imports as compared with December, 1921.

The 64 foreign-made cars and chassis imported in December, 1922, were valued at \$109,408 as against 24 automobiles and chassis having a value of \$44,696 in December, 1921. Other vehicles and parts for them imported into this country showed a marked decrease for the twelve months period ending Dec. 31, 1922, as the total value amounted to \$763,659 as against \$1,168,405 for the same period in 1921. The imports under this item for December, 1922, showed a gain over the same month in 1921, as the value in December, 1922, amounted to \$87,047 and in December, 1921, \$42,417.

Tariff Affects Reimports

One of the outstanding features of the automobile import situation was the application of the 90 per cent rate under the new tariff act on automobiles and trucks originally sold to the American Expeditionary Forces and re-imported into this country.

The statistics show that no automobiles or trucks coming under the classification of dutiable re-imports were returned during the last two months of 1922. The \$50,000 duties assessed during the period Sept. 22 to Dec. 31, 1922, were collected principally in October.

There were 2024 automobiles re-imported, free of duty, in 1922 having a declared value of \$3,101,252 as against 3504 and a value of \$5,588,700 for the calendar year of 1921.

Imports Gain in England.

WASHINGTON, April 3—There has been no marked decline in the volume of sales of foreign-built motor cars in England, according to a report received from Assistant Trade Commissioner Park, at London. The imports during January were the largest that have been made in Great Britain during the first month of any year. The records

show that the imports during January amounted to 2025 passenger cars, 140 trucks and 1499 chassis.

January imports showed an increase of 60 per cent in the number of complete passenger cars brought in and 100 per cent in the number of passenger car chassis imported, as compared with December totals, while truck chassis totaled 460 in January.

FINANCIAL NOTES

Spicer Manufacturing Co., in its annual report for 1922, which also includes the Hartford Auto Parts Corp., from June 15, 1922, states that net sales were \$9,680,190 as against \$4,912,988 in 1921. The total income was \$1,748,485, compared with \$616,448. A surplus, after preferred dividends, of \$272,744 was shown, as compared with a deficit of \$675,257. The balance sheet, as of Dec. 31, shows cash of \$571,419; inventories, \$3,931,532; accounts and notes receivable, \$1,343,648; notes payable, \$1,582,000; accounts payable, \$513,851, and surplus, \$1,017,862.

Fisk Rubber Co., reporting for the quarter ended March 31, 1923, places net sales at approximately \$14,470,000 as against \$10,143,253 in the same period last year. Net profits, after depreciation, interest and other charges, were \$1,050,000, compared with \$354,969 last year. Production in both the Fisk and Federal divisions is running at 23,000 daily.

Maxwell Motor Corp., class A stock, to the number of 22,000 shares, were sold at \$57.62 on the New York Stock Exchange, involving approximately \$1,265,000. The sale of this stock is reported to be the last of the holdings of the banking syndicate which acquired a large block when the Maxwell company was reorganized.

H. W. Johns-Manville Co. has declared a quarterly dividend of 75 cents a share on common. The common was recently split eight shares for one, so that the recently declared dividend at a rate of \$3 annually is equivalent to \$24 a share on the old stock, which formerly paid \$6 a share annually.

Black & Decker Manufacturing Co. has declared a dividend of 1 per cent on the common stock, in addition to the regular quarterly dividend of 2 per cent on the preferred, payable to stock of record March 27. The last previous payment on the common stock was 2 per cent in February, 1921.

PERFECTION BATTERY TO MOVE

ATLANTA, April 4 — The entire plant of the Perfection Battery Manufacturing Co., Chicago, manufacturer of automobile batteries and farm light and power equipment, is to be moved shortly to Atlanta, according to Howard Glenn, president of the company.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

The volume of payments by check—debts to individual accounts—reported from 243 bank centers for the week ending March 28 was \$9,166,000,000. This is \$1,000,000,000 less than for the preceding week, when income tax checks and payments for the new Treasury certificates were cleared, but is about 12 per cent greater than for the corresponding week last year.

There are other indications that business in general has expanded greatly since the first quarter of 1922. Railroad car loadings for the first eleven weeks this year are about 16 per cent greater than for the similar period last year. Loans and discounts of reporting member banks on March 21 were 8 per cent greater than a year earlier, reflecting the increased volume of business. The Federal Reserve Board's index of production in twenty-two basic industries is more than 25 per cent above the level for a similar period in 1922.

Bradstreet's index number of food prices showed a loss of three-tenths of 1 per cent for last week, but a gain of 6.2 per cent over this week a year ago. The available index of general wholesale prices, however, showed no change from the previous week. Business failures, while considerably fewer than last year, are still more numerous than in similar weeks in 1919 and 1920. Figures for the week ending March 29 are 380; for the corresponding week in 1922 the total was 515, in 1920, 113, and in 1919, only 96. The amount of liabilities involved in failures in February was 44 per cent below the amount in February, 1922.

Interest rates in the local market for sixty days to six months' money remained unchanged last week at 5½ to 5½ per cent.

Fiat 1922 Balance Sheet Shows Increased Profits

PARIS, March 24 (By mail)—According to the balance sheet of the Fiat Automobile Co., just published, the profits for the year 1922 were 19,000,000 liras, compared with only 20,000 liras for the preceding twelve months.

During the year the Fiat company has completely transformed its electric steel furnaces and has completed its six story factory at Lingotto, in the suburbs of the city.

Table of Imports and Reimports of the Automotive Industry for December, 1922, and the Twelve Months of That Year

IMPORTS	Dec., 1921		Dec., 1922		Twelve Months Ending Dec. 31—1921		Twelve Months Ending Dec. 31—1922	
	No.	Value	No.	Value	No.	Value	No.	Value
Automobiles and chassis (Duty)	24	\$44,696	64	\$109,408	522	\$876,163	483	\$802,888
Other vehicles and parts for them (Duty) .....	..	42,417	..	87,407	..	1,168,405	..	763,659
REIMPORTS								
Amount of duty collected. . . . .	..	..	..	..	..	..	..	50,000
Automobiles (free of duty) ..	66	135,466	363	442,192	3,504	5,588,700	2,024	3,101,252

Government Studies Plate Glass Sources

Takes Steps in View of Possible Shortage—World-Wide Survey Being Made

WASHINGTON, April 4—Because of increased demand for closed cars and possibilities of plate glass shortage, the Automotive Division of the Department of Commerce is now conducting a survey into the various sources of this commodity. It is expected its report will be available in two weeks.

Preliminary figures received today show that Belgium plate glass manufacturers have more orders than can be handled and they are booked ahead for several months. It is said that their prices are high because of production costs and bidding for their products.

Import statistics made available today show that 7,488,542 sq. ft. of plate glass, cast, polished and unsilvered were imported into the United States from Belgium during 1922 having a declared value of \$3,467,404.

Although demand for plate glass continued in this country, December figures show that the volume of importations of plate glass fell off slightly, due possibly to the efforts of the Belgian manufacturers to supply European automotive industries with this material. However, the total volume of plate glass imports from all countries for December showed a distinct gain over the preceding month with a total of 1,492,555 sq. ft., valued at \$766,038. These figures include plate glass products of Belgium, Czecho-Slovakia, France, Germany, Holland, England, Norway, Quebec and Ontario.

Total imports for the year of 1922 amounted to 11,196,882 sq. ft., with a declared value of \$5,090,032.

Germany Increased Exports

Despite political disturbances in the Ruhr District, Germany increased its plate glass exports to the United States in December with a total of 372,325 sq. ft., having a declared value of \$184,456. The total for 1922 from Germany amounted to 2,100,335 sq. ft.

Czecho-Slovakia ranked third in volume for plate glass exports to this country in 1922, with shipments aggregating 900,473 sq. ft.

Analysis of monthly shipments from foreign countries during the year 1922 showed a steady increase in volume of plate glass exports to this country. Belgian plate glass manufacturers shipped 1,205,420 sq. ft. in October, 1922, or approximately the same quantity as was shipped for the entire twelve months of 1920.

MILTON SETS SPEED MARK

LOS ANGELES, April 3—Tommy Milton has made an average of 114.7 m.p.h. in several trial laps on the Los

Angeles speedway in the 122 cu. in. displacement car which he will drive in the next Indianapolis race. This car is a Miller Special and is the first of six exactly alike being constructed at the Miller Engine Works for entry at Indianapolis. Four of these cars will be entered as Durant Specials and the other two as Miller Specials.

INDUSTRIAL NOTES

Berkshire Products Co., Pittsfield, Mass., successor to the J. & B. Co. and the Berkshire Magneto Co., will have its new low-price special timer in full production this month. Contracts are being placed in lots of 10,000 and the production schedule calls for 200,000 this year, and also for 12,000 of the Ford Timers previously in manufacture. The Berkshire Electric Windshield Cleaner, formerly sold as the Hawthorne Windshield Wiper, will be pushed as one of the principal products, with 10,000 scheduled for this year. Alterations have been completed in the factory which add considerable to the floor space available for production.

New Era Spring & Specialty Co. of Grand Rapids, Mich., working day and night shifts, is competing a 250 foot addition to the factory, following the plant expansions of January and February.

Gilliam Doubles Capacity by Additional Buildings

CANTON, OHIO, April 4 — The erection of three additional buildings which will double the capacity of the plant of the Gilliam Manufacturing Co., manufacturer of roller bearings, will be completed during the next six weeks. The completion of the first unit was marked by the addition of 200 workmen to the company's working force. This unit will be used as additional space for the automatic machine division.

Work is now progressing rapidly on the second unit, which is to be an all steel building. This unit, 100 x 125 ft., is now under roof and will be utilized as an additional furnace room for the heat treating division. At present architects are preparing for the third building, which, it is said, will be ready for occupancy within six weeks.

Truck Makers Will Hold Advertising Conference

DETROIT, April 4—Motor Truck Industries, Inc., will hold an advertising meeting early in April, either in Detroit or Chicago, at which representatives of advertising counsel for the different companies making up the organization will meet with the association's advertising committee to outline general plans for publicity and advertising.

The association's committee is headed by Frank Sim, advertising manager of the Timken-Detroit Axle Co., and comprises the following members: L. B. Dudley, advertising counsel, Federal Motor Truck Co.; C. D. McKim, Continental Motors Corp., and F. L. Edman, Transport Motor Truck Co.

METAL MARKETS

While buyers continue to compete with one another for every ton of steel products for which dealers are willing to obligate themselves, and the immediate tendency of prices is still perpendicular, a more sober undertone is making itself felt. The more cautious attitude in financial circles is not without its reflex on the steel market. Moreover, a slight decline in the scrap iron market, unimportant in itself but expressive of the steel industry's vigilance lest the vicious circle of price expansion make the market top-heavy, has moderated the views of many who permitted themselves to be carried away by the bright sunshine of the present and caused their giving thought to the necessities of a tomorrow on which buyers may no longer fall over themselves in their quest for steel.

Somewhat of a change appears also to have taken place with reference to the wage increases heretofore forecast as a certainty. Wage increases so far put into effect in the steel industry, with a view to increasing the supply of labor, have not had the desired effect. The supply of labor has remained inadequate numerically, but through improved manufacturing methods and enhanced efficiency in the handling of labor, this shortage to a large extent has been offset. Further wage increases would not make for enhanced production; but would merely serve to make the transition into a more quiet period of demand more difficult.

On the other hand, the conditions immediately confronting the steel industry preclude inclusive price changes for the time being, lest they be brought about by a sudden change in business conditions generally. The roller of automobile sheets who is hard up for sheet bars and who hears that one of his competitors has placed an order for sheet bars at the distress price of \$50 is not greatly comforted by reading published quotations of \$45 and \$47.50 when he is unable to secure his semi-finished material at these prices.

Consumers' reserve stocks may be assumed to be exceedingly light, else they would not be so hungry for earliest possible shipments. Compared with previous periods of high steel prices, offerings of resale and speculative lots of steel are negligible. It is little wonder, therefore, that talk persists of there coming one more advance in prices—just one more advance, trade gossip has it. Significant, however, is the fact that some producers are actually begging their customers not to buy a single pound of steel more than they actually need. It is the steel producer, rather than the steel consumer, who is thinking of the day when a reduction in prices must come, and he wants this operation to be as painless as possible.

Pig Iron.—Demand is slightly easier, but furnaces claim that their order books are comfortably filled until July 1. Therefore, they are not pressing iron for sale. The 50 cents advance in the ore market has had no effect on pig iron prices.

Aluminum.—Spot ingots, whenever obtainable, are selling at a premium over the domestic producer's price. Many inquiries are in the market, but importers are unable to quote on long-deferred positions because of the uncertainty of costs abroad. The domestic producer, it is reported, is looking after the need of regular customers, but not booking new business for delivery before July 1.

Copper.—Consumers appear less eager to buy, but producers are not forcing any metal on the market.

Calendar

SHOWS

- May 13-20—New York, Spring Salon, Hotel Commodore.
Nov. 4-10—New York, First Automobile Exposition of the Foreign Automotive Association, Hotel Astor.

FOREIGN SHOWS

- April 10-29—Madrid, Spain, International Automobile Exposition at the Palacio de Exposiciones, showing automobiles, motorcycles, accessories and equipment, under the auspices of the Chambre Syndicale de l'Automobile et du Cycle.
May 9-June 12—Gothenburg, Sweden, International Automobile Exhibition, Sponsored by the Royal Automobile Club of Sweden.
Oct. 4-14—Paris, Passenger Cars, Bicycles, Motorcycles and Accessories, Grand Palais.
Oct. 24-Nov. 2—Paris, Trucks, Agricultural Tractors, etc., Grand Palais.

RACES

- May 10—Berlin - Grunewald, German Grand Prix.
May 30—Indianapolis, Eleventh Annual 500-mile International Sweepstakes.
July 2—Tours, French Grand Prix 500-mile race.

CONVENTIONS

- May 2, 3, 4—New Orleans, Annual Convention of the National Foreign Trade Council.
May 7-10—New York, Annual Convention of the United States Chamber of Commerce.
May 7-12—Seville, Spain, Fourth International Highway Congress.
Oct. 24-26—Cleveland, Thirtieth Annual Convention of the National Association of Farm Equipment Manufacturers, Hotel Statler.

S. A. E. MEETINGS

Metropolitan Section

- April 19—Speaker, Edw. E. La Schum. General Superintendent, Motor Vehicle

Equipment, American Railway Express Co.; Subject, Engineering Features of Fleet Operation.

- May 17—Speaker, F. P. Gilligan, Secretary, Henry Southern Engineering Co., Subject, Metallic Materials for Automotive Work.

Other S. A. E. Meetings

- April 10—Cleveland Section—Psychology of Paint—Edward S. Jordan—8 p.m.—Rooms of the Cleveland Engineering Society, Hotel Winton—Visit to Sherwin-Williams Plant in Afternoon.
April 13—Buffalo Section—Electricity in the Motor Vehicle—C. F. Bishop—8 p.m., Hotel Iroquois.
April 19—National Tractor Meeting—Prof. S. O. Sjogren and C. M. Eason—Auditorium Hotel, Chicago.
April 20—Mid-West Section—General Design of Electric Trucks and Their Performance in Urban Work—J. G. Carroll—7 p.m.—Western Society of Engineers.

- April 26-28—Automotive Transportation Meeting of the S. A. E. to be held at the Hotel Winton, Cleveland. Sessions will be devoted to truck, motor bus, taxicab and motor rail car transportation, featuring operation rather than design.

- April—New England Section—Chassis Lubrication—C. A. Bacon—8 p.m.—Engineers Club, Boston.

- June 19-23—Summer Meeting of the S. A. E.—Spring Lake, N. J.

- Oct. 25-26—Production Meeting of the S. A. E.—Cleveland.
Jan. 1924—Annual Meeting of the S. A. E.—Detroit.

MEETINGS

- June 14-15—Bethlehem, Pa., Eastern Sectional Meeting of the American Society for Steel Treating, Hotel Reservations made through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem.
June 25-July 1—Dixville Notch, N. H., Summer Meeting of the Automotive Equipment Association.

Low Prices of Cars Discourage Thefts

ST. LOUIS, April 4—The National Automobile Dealers' Association has completed a compilation of theft records which show improvement in the matter of recoveries as compared with the thefts and recoveries in 1921. Reports from twenty-eight index cities for which complete figures have been kept by the association show that recoveries in 1922 were 78 per cent of thefts reported to the police department of those cities.

"Low prices for new automobiles are rapidly eliminating the possible market for stolen motor vehicles," says C. A. Vane, general manager of the association, and suggests that this will have a tremendous influence toward reducing the number of thefts.

Thefts Less Than in 1921

Vane further says:

The number of thefts in 1922 were less than in 1921, but were higher than any one of the other four preceding years. Whatever the cause may have been the total thefts and recoveries show a change for improvement. In the previous four years the trend was upward in total thefts and the percentage of recoveries steadily grew less.

New cars reached a low price level in 1922 and 1923. It is now possible to buy a new automobile for about the price that a person would have to pay to a thief for a stolen vehicle. The selling prices of used cars have settled down to an average of about \$350 a car. The automobile thief steals for profit. If his market has been changed to where he must sell for less than \$350 there will be little reward for so much risk. Taking the profit out of his efforts almost automatically takes his incentive away.

Reports of the twenty-eight cities disclose that 35,333 motor vehicles were stolen in 1922 and 26,511 recovered. The

number unrecovered was 22 per cent, which is the best record made by the police department since 1921 when 21 per cent were unrecovered.

New York again heads the list with a total number of 7107 stolen, of which only 3200 were recovered. Chicago had only 3636 motor vehicles stolen in 1922 as against 6799 for 1921. Last year 3919 were recovered, which included cars stolen in other cities. Thirteen cities showed a greater number stolen in 1922 than in 1921.

Peugeot Netted Profit in Operations in 1922

PARIS, March 24 (by mail)—A net profit of 573,971 francs is shown by the Peugeot Automobile Co. for the year ending Oct. 31, 1922. For the preceding year there was a loss of 1,890,498 francs, which was met by drawing on the special reserves. No dividend will be distributed this year, the profits being carried forward to the reserve fund.

The turnover for all departments—passenger cars, motor cycles and trucks,—is about 180,000,000 francs for the year, compared with 130,000,000 for the preceding twelve months. Increased preceding twelve months.

MORE R & V FACTORY ROOM

EAST MOLINE, ILL., April 2—Occupancy this week of the remodeled Kirkwood hotel for administrative offices of the R & V Motor Co. is in line with the program of expansion mapped out by the company and will make available greater factory space. The basement of the new office building will be used for retail sales and display rooms; president, secretary-treasurer and department heads offices will be on the first floor with advertising and supplies departments on the second.

16 Per Cent Increase in Canadian Exports

WASHINGTON, April 3—Foreign trade of Canadian automobile manufactures increased 16 per cent in February, as compared with January. Figures received by the Automotive Division of the Department of Commerce show that the exports during February were valued at \$3,393,100.

Passenger car shipments during February numbered 5668, valued at \$2,964,345 as against 4666 in January and 2719 in February, 1922. Exports of motor trucks totaled 438, valued at \$152,587, as compared with 369 valued at \$141,621 during January. Exports of parts valued at \$196,168 showed a decrease of 14 per cent.

The United Kingdom ranged to the front as the leading market during February, 2128 passenger cars having been shipped to that country, as compared with 1564 in the previous month.

70 Per Cent Gain Reported by Oldsmobile in Canada

DETROIT, April 4—Olds Motor Works of Canada, Ltd., reports 70 per cent more orders on file than at this time a year ago, despite the unusually severe winter which has tied up business over the past four or five months. In many cities, car operation was impossible during the largest part of the season while in nearly every locality the operation was confined strictly to city limits.

Sales in British Columbia, which has practically an open winter, were 58 per cent greater this winter than last. Comparisons in other provinces cannot be made fairly because of the variance in weather from year to year.